Master's Thesis

Geography

Human Geography

THE REGIONAL STRUCTURES AND SOCIOECONOMICS OF THE CONSUMER-TO-CONSUMER ELECTRONIC COMMERCE IN THE CAPITAL REGION OF HELSINKI

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Tiivistelmä/Referat – Abstract

The aim of this study is to examine the regional structures of the C2C e-commerce (consumer-to-consumer electronic commerce) in the capital region of Helsinki. The demographic and socioeconomic backgrounds of the users of C2C platforms is also in the focus in this study, to investigate whether the polarisation and differentiation trends of the city can be seen in the activity, pricing or participation in the C2C e-commerce. Interestingly, studies show that there are several reasons for participating and using the C2C trade, yet, this has not been studied in the Finnish context from a regional perspective.

The analysis in this study was quantitative, with statistical and spatial methods applied. These statistical methods include correlation analysis, linear regression as well as statistical tests, while the spatial methods conducted were clustering analysis and cartographic visualisation. The data used in this study were the content data of the classified ads and account information in Tori.fi, the largest C2C e-commerce service in Finland. This data was combined with the Paavo-statistical data from Statistics Finland that includes demographic, household, income and life-phase data on a postal code level of detail. Consequently, the data used was a summary data of both C2C e-commerce data and background variables, on a postal code level of detail, in the research area.

The results showed that there are regional structures in the C2C e-commerce in the capital region of Helsinki. Namely, an inner-city – suburban divide that can be seen in the activity, use and participation in the trade. Other results presented were that there are similarities, based on life-phase, socioeconomics and demographics, in the regional differentiation trends and the C2C trade. This study also discussed which sociodemographic variables had the largest impact on using C2C e-commerce, as well as what the most influential user background-characteristics were in the C2C trade.

Finally, the conclusions that can be made from this study are that there are regional structures in the C2C e-commerce based on the regional characteristics of the population in the capital region of Helsinki. The regional development trends can also be seen in the C2C trade, in addition to groups socially or demographically excluded from electronic commerce or information technology. The approach of this study contributes with a theoretical framework for quantitatively examining use of the C2C e-commerce using statistical and spatial methods.

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C2C e-commerce, e-commerce, internet, technology, regional differentiation, segregation, demography, spatial research, geography, Helsinki, Finland

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Tiivistelmä/Referat – Abstract

Syftet med denna forskning var att undersöka de regionala strukturerna i C2C e-handeln (konsument-till-konsument elektronisk handel) i huvudstadsregionen, Finland. De demografiska och socioekonomiska bakgrunderna bland användarna av C2C plattformen var också i fokus i denna studie för att kunna undersöka huruvida den regionala differentieringsutvecklingen är synlig i aktiviteten, prissättningen eller deltagandet i C2C e-handel. Intressant nog visar tidigare studier att det finns flertal orsaker till att delta i denna handel, dock har detta inte forskats i den finländska kontexten ur ett regionalt perspektiv.

Analyserna i denna studie var kvantitativa, med tillämpning av både statistiska och spatiala metoder. Dessa statistiska metoder inkluderade korrelationsanalyser, lineär regression samt statistiska test, medan de spatiala metoderna var kluster-analyser och kartografiska visualiseringar. Data som använts för denna studie var innehållsdata från annonser och användarkonton i Tori.fi, som är den största C2C e-handeltjänsten i Finland. Dessa data kombinerades med Statistikcentralens Paavo-data som innehåller demografisk information, hushålls-, inkomst- och livsskedesinformation per postnummer. Följaktligen var de data som använts en sammanställning av e-handelsdata och bakgrundsvariabler per postnummer i forskningsområdet.

Resultaten visar att det finns regionala strukturer i C2C e-handeln i huvudstadsregionen. Nämligen en innerstads – förorts uppdelning som är synlig i aktiviteten, användningen och deltagandet i C2C handeln. De övriga resultaten var att det finns likheter i differentieringstrenderna baserat på livsskede, socioekonomisk status och demografi i C2C e-handeln. Denna studie diskuterar även vilka sociodemografiska variabler som har störst inflytelse på användningen av C2C e-handel samt vilka de mest inflytelserika bakgrundsfaktorerna var i C2C handeln.

Sammanfattningsvis kan det dras sådana slutsatser från denna studie att det finns regionala strukturer i C2C e-handeln som baserar sig på regionala särdrag inom befolkningen i Helsingforsregionen. Trenderna i den regionala utvecklingen syns också i C2C handeln, samt grupper som är socialt och demografisk exkluderade från e-handeln eller informationsteknik. Synvinkeln i denna studie möjliggör ett teoretiskt ramverk för att kvantitativt forska, med hjälp av statistiska och spatiala metoder, användningen av C2C e-handel.

Avainsanat – Nyckelord – Keywords

C2C e-handel, e-handel, internet, teknologi, regional differentiering, segregation, demografi, spatial forskning, geografi, Helsingfors, Finland

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1. Introduction

1.1. The evolution of the internet and electronic commerce

The internet has dramatically changed how business is conducted, with universal communication mechanisms for online transactions and trade (Delone & Mclean, 2004). Consequently, online commerce has grown in its popularity during the last few decades, with countless services and businesses emerging, as well as established companies going online. The underlying reasons for businesses preferring online trade have been wanting to benefit of a greater market reach, inventory control, lower advertising costs, to name a few (Järvenpää & Todd Peter A., 1997).

With an even higher internet access across the world (over 80% in the developed countries) (ITU, 2016), it has become a convenient way of selling and buying, granting new opportunities that were not possible before. However, there are political, social and economic challenges that the internet imposes (European Commission, 2016) that also affect the electronic commerce (e-commerce) in many ways. For example, in the rise of online frauds and privacy concerns (Miyazaki & Fernandez, 2001). The emerging role of online commerce (Leonard & Jones, 2010), has also resulted in the development of platforms and services for consumers to trade amongst themselves, as a supplement to the online retail stores – a consumer-to-consumer (C2C) e-commerce. C2C e-commerce can be defined as a form of trade where the consumers transact goods or services with each other directly, often with the help of an online intermediary or third-party service (Dan, 2014, p. 30). Interestingly, studies show that in some cases and regions, the C2C e-commerce (auctions, web forums, chat-rooms and third-party consumer listings) has become more popular than the business-to-consumer (B2C) counterpart (Jones & Leonard, 2008; Wang, Wang, & Tai, 2002; Yoon & Occeña, 2015).

The essence of the C2C commerce is a person selling goods or services that someone else wants, and they connect (Lindblom & Mustonen, 2016). This kind of trade has ancient roots (Belk, 2014; Lindblom & Mustonen, 2016), however as mentioned, the internet has enhanced the commerce, changing the approach to this form of trade. The

core idea in the C2C e-commerce service is giving the opportunity for users to, for example, list goods online on a classified site for sale or auction. The online services or platforms usually facilitate this. The term "Collaborative Consumption" (CC) defined as: "the peer-to-peer-based activity of obtaining, giving, or sharing the access to goods and services, coordinated through community-based online services" (Hamari, Sjöklint, & Ukkonen, 2016, p. 2047) has also been established, and is closely linked to the C2C e-commerce, although with an emphasis on the sharing aspects. Because of these terms being closely linked, these concepts will be examined together in this study when applicable. These forms of trading have been comprehensively studied from a consumer behaviour point of view (Dan, 2014; Jones & Leonard, 2008; Leonard & Jones, 2010; Lindblom & Mustonen, 2016; Möhlmann, 2015), which also indicates a rise of interest in this field.

There are several reasons for the rise of C2C and CC services; one reason suggested is the positive ecological impact, with many services focusing on second hand products or sharing things (Hamari, Sjöklint, & Ukkonen, 2016; Lindblom & Mustonen, 2016). However, a specific dominant reason for the popularity is yet to be found (Hamari et al., 2016; Lindblom & Mustonen, 2016). Other reasons for using these services might be related to internet use, personal preferences, location, background or socioeconomic status, which I focus on in this study. The backgrounds of the users in the C2C trade will be examined especially with the current accelerated regional differentiation in mind, also taking into consideration the current development of more unequal and segregated cities (Musterd, Marcińczak, van Ham, & Tammaru, 2017; Vaattovaara, 1998, 1999; Vilkama, 2011). The research area in this study is the capital region of Helsinki, Finland, consisting of the municipalities Helsinki, Espoo, Vantaa and Kauniainen.

1.2. The aims of the study and research questions

In this study, I will focus on the socioeconomic backgrounds of the users in the C2C e-commerce. I will examine if there are any (regional) patterns in this e-commerce and its use, and whether the background of the consumer determines the behaviour and

proneness of using these services. The regional aspects of the C2C e-commerce have not yet been thoroughly studied, and are therefore, an interesting approach in this field of study. The aim is also to investigate if the polarisation and differentiation of the city can be seen in the C2C e-commerce. The purpose of this study is to confirm and challenge earlier studies, with a regional perspective, using location data, statistics and geographic information system (GIS) methods.

For examining the C2C online market in the capital region of Helsinki, the following research questions have arisen. They reflect the geographical approach that is chosen, and will build a framework for further related studies.

1. Are there regional structures in the C2C e-commerce in the capital region of Helsinki?
2. Does the socioeconomic status of the inhabitants determine the use of C2C e-commerce services in the study area?

I will answer the first research question by analysing data from the largest C2C e-commerce marketplace in Finland, Tori.fi (https://www.tori.fi/). Tori.fi (founded in 2009) is an online consumer to consumer service, with over a million monthly visits, where one can buy, sell and trade (Tori.fi, 2016). Tori.fi is a part of the international Schibsted Media Group (Tori.fi, 2016). By combining the trade-data with the demographic data of Statistics Finland's Paavo data (Statistics Finland, 2017a) (see 3.3. Description of the data, for details), I will answer the second research question, by for instance researching how the users are trading in the research area, what they trade, the price of the goods as well as the regional distribution of the users in the research area. By looking at the demographics I will determine the current circumstances in the region and its socioeconomic differences.

To answer these research questions, the hypotheses, which are based on the background research presented in the next section, are the following:

H1: Age, gender and education affect the activity, use and participation in the C2C e-commerce in the Helsinki capital region.

H2: Life-phase and regional differentiation structures can be seen in the activity, use and participation in the C2C e-commerce in the capital region of Helsinki.

H3: The suburban inhabitants are more active in the C2C e-commerce than the inner-city counterparts in the capital region of Helsinki.

H4: Women are more active in the C2C e-commerce in the study area.

2. The internet and the users of electronic commerce

2.1. Space, place and information technology

Graham (1998) discusses the linkages of space, place and information technology from a geographical point of view, emphasising the societal change it causes. Graham (1998) argues that it is impossible to look at the networks of technology without taking into consideration both space and place. This exemplifies the linkage between these concepts, and relates to the discussion of perceived distance. An example of how technology affects the perceived distance is how the global financial centres, such as London and New York, are closer linked together than before. In general, the information technology has brought certain places closer to each other, while some physically neighbouring areas are less closely linked (Graham, 1998). The effect the information technology has on society can also be seen in the metaphors used to describe it, with for example concepts like “information superhighway” that shows the assumed spatial and social change in a technological deterministic way, as Graham (1998, pp. 166–168) describes it.

One assumption made in this discourse, is that the spatial relevance of urban areas would diminish because of the transition to online communication. However, it is essential to realise that despite this technology discourse, emphasising the role of the internet and information technology as a substitute for the physical space, it is in reality

a complex "co-evolutionary process" that combines the traditional views on space and place with the emerging online realm (Graham, 1998, pp. 171–172). This approach is important to bear in mind when discussing the internet and electronic commerce, whereas even though the internet has increased the opportunities to trade virtually, the physical location is still relevant in the electronic commerce. This is also important to consider when examining the regional structures of the e-commerce, and although there are currently less physical location strains, it is arguably still relevant for the users of the C2C e-commerce.

2.2. Internet access

2.2.1. The internet and information technology

"The Internet has revolutionised the computer and communications world like nothing before" (Leiner et al., 1997). This quote from 1997 describes well how revolutionary the breakthrough of the internet was considered to be in the late 1990's. Other scholars share this view, with for example Castells (2010, p. 31), who discusses what the characteristics are for the development in the technology sector, also calling it a technical revolution. He draws parallels with the industrial revolution and the technical revolution, which emphasises how impactful this progress, according to Castells (2010, p. 31) has been. One important step in the history of the internet has been the change from stand-alone systems to the interconnected internet (Castells, 2010, p. 51), we take for granted now. Inevitably, the influence of the internet is globally revolutionising and it is because of this progress the online commerce has flourished.

These technology advances are the foundation from which the current electronic commerce has emerged. The use of online commerce is naturally tied to access to the internet and general knowledge of information technology. Therefore, internet access and knowledge are vital aspects to look at before examining the online trade more thoroughly. One important concept to inspect is the concept of "access to information", which McCreadie & Rice (1999) discuss. The impact this access to information has on our lives, with the economic well-being and daily errands it enables among other things, is highlighted in the article. The potential problems non-users or outsiders face are also

mentioned in in McCreadie & Rice (1999). However, in this context of the capital region of Helsinki, the internet access or access to technology in 2017 is not a significant problem. Considering that in 2016, 72% of the population in Finland used the internet daily and 88% used the internet, it is safe to say that the internet access in Finland is very high. Among the population that is under 55 years old nearly everyone has used the internet, while there are certain older age groups where the reach is remarkably smaller (74% of the 65–74-year-olds have used the internet) (Statistics Finland, 2016a).

There are also spatial aspects that should be taken into consideration when discussing internet access, for example a rural-urban divide in internet access in the United States (Sarkar, Pick, & Parrish, 2017). However, it is also good to note that physical access to the internet might not be the optimal way to investigate internet use, with the technology well established in Finland. Therefore, even though the access to internet is high, this does not tell us about the online preferences or technology knowledge, which is a topic in the debate about a digital divide. This point of view is also highly relevant for the use of online commerce, where certain demographic or socioeconomic groups might be, in different rates, willing to participate in the trade.

2.2.2. The digital divide

The digital divide as a concept has been discussed for decades, originating from the research of other media, such as the TV. Generally, the earlier studies focused only on physical access to a media and its consequences, while the newer studies have been more interested in the underlying purposes and the use of the internet (van Deursen & van Dijk, 2014). For that reason, these studies also emphasise the transition in the media research, moving from studying the accessibility of the internet to its use (Lang & Hillmert, 2016; van Deursen & van Dijk, 2014). This transition is also called the second-level digital divide (Helsper & Reisdorf, 2016). The newer approaches in this field are also considering the attitudes and how socialisation determines the use the internet among the population. One reason for this shift, going from looking at accessibility into more deeply examining the usage and skills, is caused by the

commonness of the internet, especially in developed countries. In countries where the internet access is high, the isolated groups of non-users have been increasingly smaller and concentrated to specific groups – a "digital underclass", that are even more digitally excluded (Helsper & Reisdorf, 2016). Helsper & Reisdorf (2016) have studied this in Sweden and the United Kingdom, which are well-comparable to the Finnish context. One reason for the existence of the digital divide, might be the socio-economic inequalities in society (Fuchs, 2009; Helsper & Reisdorf, 2016; Ono & Zavodny, 2007). However, there are several reasons for the digital divide, underlining the complexity of this issue (Fuchs, 2009). These issues will be discussed more comprehensively in the Demographics and socioeconomics of the internet section (2.2.3.).

Because of the digital divide or digital exclusion, the benefits of the online technology are mostly available for those that have the chance or proficiency to take part in the online world. Therefore, when discussing technology such as the internet, it must be taken into consideration that there are certain groups in society that are potentially excluded from this domain. These groups have fewer opportunities to utilise the online services, and are potentially more exposed to being segregated from society, when thinking of the increasing digitalisation and its requirements. As it seems, these problems are not necessarily linked to poor internet access, but the non-use of marginalised groups.

2.2.3. Demographics and socioeconomics of the internet

The backgrounds of the internet users have also been studied (for example Helsper & Reisdorf, 2016; Lenhart, Purcell, Smith, & Zickuhr, 2010; Porter & Donthu, 2006), which is crucial to consider when studying the e-commerce. Studies show that there are demographic and socioeconomic factors that impact the use of the internet. Factors such as age, education, income and race distinctively influence the attitudes towards the internet, and therefore, also the use (Porter & Donthu, 2006). Porter & Donthu (2006, p. 1004), shows that the perceived ease of use is lower among the older and less educated, the ethnic background impacts the perception of technology cost, and the access barriers to the internet are more apparent for older age groups. The attitude towards

internet varies depending on age, education and income in North America (Porter & Donthu, 2006). I would argue that these factors are less prominent in the Finnish context. Ono & Zavodny (2007) also discuss the backgrounds of internet access and use. The results of this study (Ono & Zavodny, 2007), show that there are connections with social inequality and internet access. This means that those that are less well-off socioeconomically, have fewer opportunities to take advantage of this technology. From this, we can also draw the conclusion that these issues reflect the characteristics of the society at hand, which means that the consequences of the digital exclusion are depending on the context, which also Helsper & Reisdorf (2016) argues.

Helsper & Reisdorf (2016) discuss how the non-users of the internet have been concentrated to more vulnerable groups in society in Sweden and Great Britain, which has been seen as a lack of interest in using technology among these groups (Helsper & Reisdorf, 2016). The European context of this study, with access to the technology no longer a significant issue, makes this research even more valuable to investigate, especially when thinking of the research area of the capital region of Helsinki in this study. In the article "The emergence of a 'digital underclass' in Great Britain and Sweden: Changing reasons for digital exclusion" Helsper & Reisdorf (2016) emphasise that there are many reasons for being a non-user, and argue that is not only related to the background or socioeconomics of the users. Notable is also that this phenomenon is changing, meaning that what was studied in the 2000's might not be as relevant anymore, in terms of online participation. This also opposes a challenge in anticipating the future of internet use (Helsper & Reisdorf, 2016). Studies found that the engagement in information technology tends to be the worst among people that would benefit the most of online services, such as those with economic and social disadvantages (Helsper & Reisdorf, 2016). These socio-economically disadvantageous groups are also the most active users of offline services (Helsper & Reisdorf, 2016).

Helsper & Reisdorf (2016, p. 15) also argue that "[…] overall non-users in Sweden and Britain are increasingly older, less educated, more likely to be unemployed, disabled and socially isolated". Interestingly, lack of interest in using the internet, as well as cost and access contribute to the non-use, which seems to contradict the earlier discussed

shift (see the digital divide 2.2.2.) to IT-skills as determinate for internet use (Helsper & Reisdorf, 2016). Also, the demographics and socioeconomic backgrounds of the non-users are different than in the past, and is often strongly related to the context of the country, which emphasises the need of adaption in policies and strategies to combat digital exclusion (Helsper & Reisdorf, 2016).

Age is also discussed as a factor for participation in online communities (Chung, Park, Wang, Fulk, & Mclaughlin, 2010), which can also provide insights about the demographics of the e-commerce. Chung et al. (2010) mentions that the younger and older demographics may use the internet differently and that, although the internet access among the older population has increased, there is a generation gap in the behavioural intention to adapt technology and the perceived usefulness of the internet. The younger individuals are also more likely to shop online, and demographics are very likely to have a role in the prediction of the e-commerce activities (Joines, Scherer, & Scheufele, 2003), which has an essential part in this research when studying the C2C e-commerce. However, Joines, Scherer, & Scheufele (2003) also note that the motivational factors of internet use and shopping should not be undermined.

2.2.4. The digital natives

With the high internet and information technology access among young people, a discussion about digital natives (Prensky, 2001, p. 3) has emerged. The digital native-term (Prensky, 2001) has appeared from the debate about a new generation that is more familiar and reliant on information technology (Bennett, Maton, & Kervin, 2008) This generation, according to Bennett, Maton, & Kervin (2008), is born roughly in the 1980's and the early 1990's, making them around 25–35 years old in 2017. I would also argue that all the younger generations today are as exposed to information technology, especially in the Finnish context. This group is described as the Net-generation or Digital-generation (Prensky, 2001), by some social researched labelled as millennials (Bennett et al., 2008; Lenhart et al., 2010) and are supposedly used to dealing with information at a faster pace and multi-tasking. Therefore, in for example education, Prensky (2001) suggests that this generation learn and behave in a different way, when

thinking of information technology. He also states that this should be adapted to. Thus, my suggestion is that this generation described above, would use digital services in a different way that could also be seen in more eager participation in the electronic commerce. There are, however, many common misconceptions regarding the use of technology by these digital natives (Selwyn, 2009).

The digital native-term has also been criticised, and even its existence questioned. There are a few assumptions made in the literature that Selwyn (2009) opens in the article "The 'digital natives' debate: A critical review of the evidence". For example, one assumption made is that this generation have higher skills and knowledge about information technology. Although information technology is highly available and used by the digital natives, the studies show that the use and skills are not uniform. This also confirms the reasoning discussed earlier, where the general focus on internet studies has shifted from looking at internet access to the actual use and its implications.

The technological circumstances, discussed above, establish the background to the actual use of the electronic commerce, and could also be considered the basic requirements for participation in the trade. Therefore, the background of the consumers is arguably important to take into consideration when thinking of the electronic commerce. Even though some groups might be more prone to use the internet for making purchases, we cannot generalise and say that this would be the case with everyone. In the context of this study, this means that I will focus on the actual use of the C2C e-commerce, rather than drawing conclusions based on generalised demographic stereotypes. In the next section, the electronic commerce, its users and trust in e-commerce will be discussed. In addition, I will also look at the distinct features of the C2C e-commerce that presumably displays different behaviours and dynamics, when compared to the traditional online trade.

2.3. Electronic commerce

2.3.1. General description of the electronic commerce

To examine the C2C e-commerce, it is important to start by looking at the characteristics of the e-commerce as a form of trade. The electronic commerce is defined as the ability for consumers to buy products or services online, using internet technology (Olson & Olson, 2000; Pavlou & Fygenson, 2006). This form of trade can either be business-to-consumer (B2C), business-to-business (B2B) e-commerce or consumer-to-consumer (C2C) e-commerce, depending on who the actors are. The growth of online technology and the internet services has enabled improved communication and interaction between individuals, without the location-strain of the traditional commerce (Olson & Olson, 2000). This also makes this topic increasingly interesting from a geographical point of view.

The benefits of the electronic commerce have also been widely discussed. For example, when looking at how the individual consumer benefits from these services, Delone & Mclean (2004, pp. 39-40) mention improved customer support and service, improved customer knowledge and reduced information search time. Other benefits are, for example, the improved customer experience, reduced shopping cost and the opportunity for real-time marketing offers (Delone & Mclean, 2004). There are also a vast number of benefits from an organisational point of view, with growth in the customer base, increased sales and various operational efficiency improvements. Other gains are a global market reach and customer acquisition, to name a few. These last-mentioned gains are, in the literature, considered new e-commerce success measures (Delone & Mclean, 2004).

From these examples above, we can see that there are a lot of benefits related to the use of electronic commerce. These are some of the many reasons for the growth in the electronic (B2C) commerce in the developed world (Ho, Kauffman, & Liang, 2007). Other drivers for this economic growth in the commerce, as studied in Ho, Kauffman, & Liang (2007, p. 240), are the GDP per capita, urbanisation, the information structure, the cost of online shopping and geographic and demographic aspects. As mentioned, these geographic and demographic aspects of the growth in the e-commerce are highlighted in this study.

However, for the benefits of the electronic commerce to show, the adaption of the online commerce must be looked at (Gefen & Straub, 2000; Pavlou & Fygenson, 2006). Davis (1989) established the technology acceptance model (TAM), which is one of the most known models for technology adaptation (Gefen & Straub, 2000). Since the technology adaptation is one prerequisite for the use of e-commerce, it is significant to take into consideration. In this TAM-model Davis (1989) mentions two important aspects that determine whether we accept or reject information technology. These are the perceived usefulness and the perceived ease of use. The perceived usefulness is considered a sign of adaptation, since the users of technology evaluate, whether the technology can be used to improve the efficiency of their tasks or not. The ease of use determine if the users potentially find the technology too hard to operate, which would outweigh the benefits (Davis, 1989). These two aspects, therefore, define the intention of the use of information technology.

The adaptation of electronic commerce is generally described as the engagement with online vendors (Pavlou & Fygenson, 2006). For the consumer, the key online consumer behaviours are searching for information and buying a product (Gefen & Straub, 2000, pp. 10-11; Pavlou & Fygenson, 2006, p. 116). These are also arguably the most important stages of consumer behaviour in the online commerce that show the adaption of the commerce, despite many studies focusing only on the purchases made (Pavlou & Fygenson, 2006). The e-commerce adaption of companies, on the other hand, are affected by for example the firm size and security costs (Sila, 2013).

I would argue that the engagement pattern is the same in the C2C e-commerce, when looking from a buyer's perspective. However, the interaction is what sets the B2C e-commerce and the C2C e-commerce apart, with no business necessarily involved and the transactions often handled differently. Also, the opportunity of flexible roles of both being a consumer (buyer) and a provider (seller) is quite different from the traditional B2C-trade. These aspects make trust, especially in C2C e-commerce, a vividly debated topic, but also from the perspective of the B2C e-commerce. Hence, trust also affects the adaptation of this form of trade, which will be discussed in the following section.

2.3.2. Trust in electronic commerce

In the B2C electronic commerce trust is one of the most important factors for improving the relationships with customers as well as conducting successful business (Corbitt, Thanasankit, & Yi, 2003). Quelch & Klein (1996) also emphasise the critical role of trust for the e-commerce, and its role in the online marketing. This shows that it is a debated topic that has its roots from the 1990's, but is still today identified as an important topic in the e-commerce debate (Kim & Peterson, 2017). When business is conducted online, there are greater uncertainties and risks compared to traditional stores, with less possibilities for the consumer to see and feel the product (Reichheld & Schefter, 2000). Reichheld & Schefter (2000) also state that the price of products does not primarily influence online shopping, while the trust of the consumer has a much larger impact. Consequently, there are many factors that affect the perceived trust in the e-commerce. The three main attributes that have an impact on the trustworthiness in the electronic commerce are ability, integrity and benevolence (Kim & Peterson, 2017, p. 45; Lee & Turban, 2001, p. 77; Lu, Zhao, & Wang, 2010). Ability refers to the competence of the online business, integrity meaning that the vendor is reliable and benevolence implying that the business is not only trying to maximise profits. Lee et al. (2001) also discuss the term of reputation that combines these three trust-evoking attributes. The research in e-commerce also highlight frauds and privacy concerns as factors for the trust in the e-commerce (Chiu, Wang, Fang, & Huang, 2014; Järvenpää, Tractinsky, & Vitale, 2000; Miyazaki & Fernandez, 2001), which might have an even more critical role in the C2C e-commerce.

Interestingly, there are also contradicting studies regarding what attributes impacts the perceived trust of an online vendor. For example some studies show that the perceived size of the vendor is significant, while being insignificant in others (Kim & Peterson, 2017). Kim & Peterson (2017) also note that individual differences in the perceived trust in the e-commerce have seldom been studied. This means that the discussion in the e-commerce trust-literature has its focus on general findings and common trust aspects, instead of focusing on individual demographics and background as indicators for perceived trust in the electronic commerce. As we can see here, the trust aspects are

generally important in the e-commerce – also when looking at the C2C e-commerce. This will be discussed in the section 2.4.2. Trust in C2C e-commerce.

2.4. Consumer-to-consumer electronic commerce

2.4.1. The definition of the C2C e-commerce

The consumer-to-consumer electronic commerce (C2C e-commerce) is defined as a business model where individuals directly transact or conduct business with each other (Leonard, 2012). This is usually, but not necessarily, conducted using third party websites or forums (Leonard, 2012) that enable this form of trade. What also characterises the C2C e-commerce is that the platform is not responsible for the exchange of goods, which consequently is done by the users. (Dan, 2014, p. 30). The C2C commerce has ancient roots, with sharing and trading in mind. However, the internet and new technology has changed the way in which consumers have had the possibility to trade amongst each other, rather than using intermediary businesses (Belk, 2014; Lindblom & Mustonen, 2016). Thus, the growth of the C2C e-commerce has been great when looking at the development of the market share during the last decade (Dan, 2014; Leonard & Jones, 2010), with webpages (such as Tori.fi in Finland), being popular C2C services that have allowed this growth. In this section I will define the characteristics of the C2C e-commerce, discuss trust in C2C trade, as well as discuss how it is used and who the users are in the context of Finland. I will also exemplify the similarities in the B2C and C2C e-commerce, but also highlight the clear differences with the backgrounds of internet access and the e-commerce in mind.

The C2C e-commerce facilitates many ways of trading. Some of the important functionalities of the C2C e-commerce is the opportunity to trade with many sellers, the ability to act as both a buyer and a seller as well as the social aspects of trading directly with private persons (Dan, 2014). Dan (2014) also discusses the advantages and disadvantages of the C2C e-commerce. The advantages of the C2C e-commerce, according to Dan (2014), are that there are no constraints to when the consumer can trade, there are higher profitability margins when selling directly to another consumer, and the communication is done directly with the seller or buyer. In addition, the regular

updates on the sites and the low transaction fees are mentioned. Of the advantages that Dan (2014) lists, I find the most important to be the fact that there are very low transaction costs. This means that the consumers can post their classified ads online, usually for free, without having to resort to renting space or otherwise organise a venue for the trading. Other reasons for using the C2C e-commerce are the positive ecological impact it has, as well as personal preference and the satisfaction the consumer gets from trading (Lindblom & Mustonen, 2016). There are also some disadvantages when using online consumer-to-consumer services. These disadvantages are, to name a few, that the payments are not guaranteed, there is an increased risk of fraud or imposters, and it is hard to determine the quality of the merchandise (Dan, 2014). These are some C2C e-commerce specific advantages and disadvantages, although, generally they are roughly the same as in the B2C e-commerce, especially when thinking of the technology benefits.

Leonard & Jones (2010) discuss the research which has been done in the C2C e-commerce field, and identify trust as one of the key subjects in this literature. It is also pointed out that the research field is focused mainly on online auctions and communities, which shows that there is room for further studies with different approaches (Leonard & Jones, 2010). Because of the emphasis on trust in C2C e-commerce (research), it will be discussed more thoroughly in the next section along with its implications.

2.4.2. Trust in C2C e-commerce

Trust is an important factor in the e-commerce (Kim & Peterson, 2017; Quelch & Klein, 1996), as previously mentioned (section 2.3.2), with the increased perceived risks and uncertainties in using online transactions. This is also the case in the C2C e-commerce, where the risks are potentially amplified (Strader & Ramaswami, 2002). Trust-aspects such as integrity, ability and benevolence (Kim & Peterson, 2017, p. 45; Lee & Turban, 2001, p. 77; Lu et al., 2010), are as well perhaps less clear in the C2C e-commerce. Especially integrity, meaning the trust evoked by the seller, enables the possibility for the consumer to be less certain when dealing with private persons instead of companies. Trust in the C2C e-commerce has been comprehensively studied, and in

this section I will highlight the findings from a consumer point of view, to be able to determine how trust affects the C2C e-commerce.

Trust is important in the C2C e-commerce because it helps the consumer to face uncertainties and perceived risks when using the services (Jones & Leonard, 2008). Jones & Leonard (2008) also argue that since this commerce is quite a new phenomenon for many, trust is important to build to encourage the use of online C2C transactions. How the consumers of the C2C trade must assume two roles, both as trustors and trustees, is also mentioned. This also demonstrates the special dynamics of the C2C e-commerce for the consumer, where the trading is a different two-way interaction compared to its B2C counterpart. Trust can be looked at as internal trust, meaning the proneness of an individual to trust, or as an external trust focusing on the service used, its quality as well as earlier experiences (Jones & Leonard, 2008). When looking at external trust, the most significant factor seemed to be third party recognition, which means that the trust of the consumer, in C2C e-commerce, is tied to the services that provide the opportunity to trade. Therefore, the consumer finds established, high quality sites with a "seal of approval" to have a role in the trust displayed when participating in the C2C e-commerce. (Jones & Leonard, 2008). Strader & Ramaswami (2002) also mention how trust is important especially in the first transaction between the individuals.

As we can see, many of the factors influencing trust are common for both the B2C and C2C e-commerce. However, there are specific trust factors that are only relevant for the C2C e-commerce. As discussed earlier, the reputation of both the seller and the buyer is important in the C2C trade (Sutanonpaiboon & Abuhamdieh, 2008), and this trust influences the consumer's attitude and behaviour towards future online transactions. Another factor, specific for the C2C e-commerce and apart from the above mentioned, is the relationships and personal acquaintances between the consumers (Sutanonpaiboon & Abuhamdieh, 2008). In peer-to-peer (P2P) lending marketplaces, which in nature are quite similar to the C2C e-commerce, (Greiner & Wang, 2010, p. 131) have found that "[…] trust-building mechanisms enable individuals to differentiate themselves by providing signals of trustworthiness". This implies that the users

themselves attempt to improve their trustworthiness, by for example adding personal information, as an asset for improving their success in the trade. This could also be the case in C2C e-commerce platforms where trust is as central. Nevertheless, when looking at the C2C e-commerce trust, age also seems have an effect. Yoon & Occeña's (2015) study shows that third party recognition is the most important for the younger age groups from 20 to 30-year-olds, while the trust of the buyer or seller is more significant for the older age groups above 40. This ought to affect the participation in the C2C e-commerce and can potentially be seen in the results of my study.

In the following section, I will look at an aspect that has a role in the internal trust debate, namely the backgrounds of the users in the C2C e-commerce. Although trust is identified as one of the important factors in the e-commerce, it is as vital to look at who are participating and using the C2C e-commerce, which is one focus area in this study. It is also as valid to consider the motivations for using online C2C platforms. This background of discussions about internet access, electronic commerce and trust, lays the foundation for the examining and understanding the demographic and socioeconomic backgrounds of the consumers in the C2C e-commerce. This foundation is also vital to understand when looking at the regional aspects of this phenomenon in the research area of the capital region of Helsinki.

2.5. Demographic and socioeconomic backgrounds in the C2C e-commerce

2.5.1. The basis, user backgrounds and motivations for using C2C commerce

The demographics of the C2C (electronic) commerce users have been studied in the Finnish context, specifically in Helsinki (Lindblom & Mustonen, 2016). This provides a background for this study, where the interest is in the capital region of Helsinki. I argue that the findings, in respective studies, are well-comparable. What sets this thesis apart from earlier studies of the C2C trade in Finland is the focus on quantitative data and specifically online trade, which means that actual observed use of the e-commerce is looked at. This is done instead of relying on user surveys. The downside of this, however, is that the motivations of participation in the trade as well as the use of other platforms than Tori.fi are not included in the empirical part of this study.

The population in Helsinki have positive attitudes towards the C2C commerce, although it is not the most common form of trade among the citizens (Lindblom & Mustonen, 2016). Lindblom & Mustonen's (2016) study also points out that the groups that have the most positive attitude towards the C2C trade, are the ones using it the most actively. The characteristics of these groups are high education, young age (adults aged 25 to 35) as well as the suburban residence. Age and location also have a role in the attitudes towards the C2C commerce in Helsinki (Lindblom & Mustonen, 2016). Therefore, the C2C commerce is more popular among younger demographics, while consumers above 45 years of age are significantly less prone to participate in the trade. The findings in Lindblom & Mustonen (2016), however, do not show any major differences in the behaviour of buyers and sellers. Lindblom & Mustonen (2016) show that the likeliness of using C2C commerce, as a part of consumer habits, increases with higher education. Interestingly, these results also show that although women are more eager to use the C2C commerce, they also generally find it more challenging.

From the results in Lindblom & Mustonen (2016), it can be assumed that internet use and technical skills also determine how difficult the consumer perceives the C2C e-commerce, and thus the participation. Especially the less educated and older population (above 55-year-olds) find the C2C trade difficult, which would confirm this statement. This also shows how the C2C e-commerce is linked to the sections discussed earlier, with internet access and information technology in mind. However, the use of C2C e-commerce is not only determined by the socioeconomics or demographics of the consumers, but also lifestyle and personal choices (Lindblom & Mustonen, 2016). One of the biggest lifestyle groups in Lindholm & Mustonen (2016) were the ecologically aware consumers, which mainly use the C2C trade for ecological reasons. The motivations for this group to use the C2C trade, is to have a lesser impact on climate change and reduce waste. Other groups identified in this study were the trendy consumer that wants to participate in the latest form of trades, and the social consumer who enjoys the C2C trade because of its social aspects. These groups illustrate well how there are many motives in participating in the commerce, which also means that unambiguous results, based on the background of the participants in the C2C e-

commerce, cannot be found. Therefore, as a conclusion, it can be said that the socioeconomic background as well as lifestyle and life-phase together determine the use of C2C e-commerce. In the following section I will discuss the socioeconomic characteristics of the research area.

2.5.2. The social and regional differentiation in the capital region of Helsinki

The social and regional differentiation, initiated by the structural changes in the city, entails polarisation and social exclusion of the inhabitants, with a regional division in well-being (Vaattovaara, 1999). As terms, the social and regional differentiation should be distinctly defined. Vaattovaara (1999) argues that when discussing social differentiation, the focus is on the social parts of phenomenon, even though the spatial dimensions are an important part of the social differentiation. However, it is not a necessary part of it, as it is in the regional differentiation concept (Vaattovaara, 1999). Since this study has a geographical point of view, these terms will be mostly used as synonyms.

Social and regional differentiation has been a discussed topic in urban studies in the Helsinki region (Vaattovaara, 1998, 1999; Vilkama, 2011; Vilkama, Ahola, & Vaattovaara, 2016; Vilkama, Lönnqvist, Väliniemi-Laurson, & Tuominen, 2014; Vilkama & Vaattovaara, 2015), as well as internationally by for example Sassen (2001) and Musterd, Marcińczak, van Ham, & Tammaru (2017). The urbanisation and migration to cities has also caused changes in the work- and real estate-structures (Sassen, 2001, pp. 305–325; Vaattovaara, 1999; Vilkama, 2011), which has contributed to this current development. Sassen (2001, pp. 305–325) also discuss the greater inequality in the distribution of wealth and how this has led to a more polarised society. This global polarisation development has also been seen in the context of Finland, although the effects of it have been milder (Vaattovaara, 1998; Vilkama, 2011). The impacts of this polarising trend, have caused an increased socioeconomic and ethnical differentiation in residential areas in the Helsinki area (Vaattovaara, 1998; Vilkama, 2011; Vilkama, Lönnqvist, Väliniemi-Laurson, & Tuominen, 2014), which has been considered as a problematic progress. To mitigate this development, considerable

resources have been allocated in Helsinki to combat these issues (Vilkama et al., 2014) and it is, indeed, through urban planning that necessary precautions should be taken (Vaattovaara, 1998, p. 21). Vilkama et al. (2014) also identifies the main threat, related to this differentiation, to be the possibility of social disadvantages to be regionally inherited. The development of residential areas, where the disadvantageous position would be amplified, above what is anticipated by the socioeconomic background, is also mentioned as a problem. Because of these regional effects, the social differentiation is not only seen as issue of economic disparity (Vilkama et al., 2014).

Some important dimensions, when looking at the social and region differentiation, are education level, unemployment and the share of persons with a foreign language (Vilkama et al., 2014). Other studies have researched tenancy status, apartment type and income for determining the socioeconomic status and social differentiation (Vaattovaara, 1998, 1999). Still, there is no single definition for socioeconomic status, but generally it is seen as a combination of aspects as wealth, power and status (Mueller & Parcel, 1981, p. 14; Sirin, 2005, p. 418), that influences the social differentiation (Vaattovaara, 1998, pp. 138–139). However, Vaattovaara (1998) argues that the most powerful dimension in social differentiation is life-phase, and that there is a clear pattern of a centre-periphery differentiation. To sum it up, all these factors are indicators of social differentiation of the city, and depending on the geographical context different issues might arise.

In the capital region of Helsinki, all these above-mentioned factors are contributing to the urban differentiation. The results in Vaattovaara (1998) show that over 30% of the regional differentiation, in the capital region of Helsinki, is constituted by life-phase. Families with children, living in the periphery, have the biggest impact on these results (Vaattovaara, 1998, p. 138). This group can especially be seen in the sparsely populated north-western parts outside of Ring three (the outermost highway belt connecting the Helsinki region municipalities). On the contrary, this life-phase factor has low values in the inner-city as well along the railway (Vaattovaara, 1998, p. 138). When looking at socioeconomic status factors, such as prosperity, there seems to be a clear pattern of higher income and socioeconomic status along the western shoreline (in Espoo) and the

inner-city, while the lower socioeconomic areas display a more irregular pattern, described as mosaic. There are however, some concentrations of disadvantageous population in the east-north-eastern regions in the Helsinki capital region (Vaattovaara, 1998, pp. 138–143). However, the dynamics of the research area have inevitably changed to a certain extent during more recent years, and the differentiation has possibly even been amplified. Yet, newer studies find that these above mentioned observations of the Helsinki area are still valid, and the region's features have persisted the same, relatively (Vilkama, 2011; Vilkama et al., 2014). This is also the case when looking at other capital cities in Europe (Musterd, Marcińczak, van Ham, & Tammaru, 2017). These are all factors that affect the regional differentiation in the capital region of Helsinki, and will be taken into consideration when looking at the C2C e-commerce in the area.

2.6. Ecological fallacy when studying spatially aggregated data

When conducting regional (differentiation) research, it is important to realise the limitations of using a lower administrative level of detail in the analysis and data. There might be statistical errors when using administrative regions, such as postal code areas, instead of a non-aggregated household specific data in describing properties of an area. This is usually described with the term ecological fallacy and might cause spatial aggregation problems (Openshaw, 1984). These problems occur when the mean of an administrative region does not describe the differences within the area, as seen in figure 1, which for example shows how the zone household size mean of four only represents two houses in total and not the larger household size of twelve in the centre of the area (Martin, 1996). Martin (1996) exemplifies further how statistical relationships not automatically hold true in observations on a higher level of aggregation; high positive correlation with unemployment and immigrants in a region does not necessarily imply that the immigrants in fact are unemployed. Therefore, the smaller the area, the more certain one can be of that the results do not have an ecological fallacy. Nevertheless, using data on a household level of accuracy, when available, would diminish the potential ecological fallacy inconsistencies in the data.

Openshaw (1984) emphasises that there is no theoretical guarantee of creating a good model on an individual level when using aggregated data, which is also why data at a higher aggregated level can better describe area features rather than the characteristics of the individual. This, however, is to be taken into consideration in the spatial analysis in the context of this study, whereas it is not as crucial in the statistical analysis where many regions are looked at simultaneously. For the ecological fallacy problems to be present in the statistical analysis, many regions would have to be misleading at the same time to affect the result.

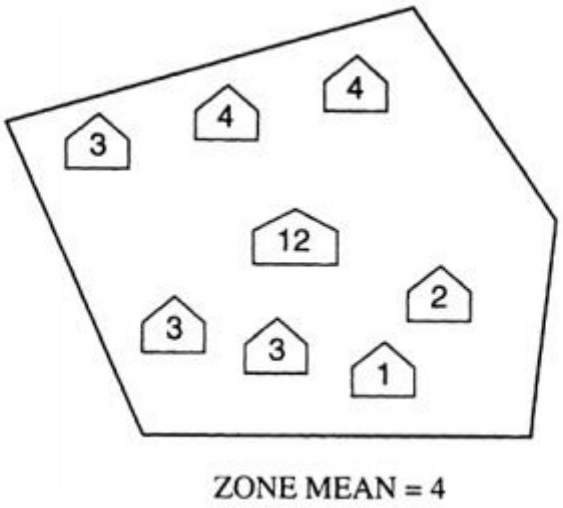

Figure 1. Example of ecological fallacy in household size in a zone (Martin, 1996). In this case the zone mean is four; however, it does not describe the area characteristics.

2.7. Concluding findings and hypothesis reasonings

Research on the digital divide suggests that digital exclusion might be explained by national-level infrastructure, regulation, and socio-economic inequalities (Fuchs, 2009; Helsper, 2012; Helsper & Reisdorf, 2016; Ono & Zavodny, 2007; Witte & Mannon, 2010). Thus, this is one of the aspects I will look at when analysing the structures of the C2C e-commerce and this justifies also the first hypothesis (H1) presented.

The second hypothesis (H2) in this study is related to the socioeconomics of the capital region of Helsinki. As mentioned, one third of the regional differentiation is contributed

to the life-phase of the inhabitants (Vaattovaara, 1998), and there are clear regional structures of the population in the study area (Vaattovaara, 1998, 1999; Vilkama, 2011; Vilkama, Lönnqvist, Väliniemi-Laurson, & Tuominen, 2014), which clearly justifies the second hypothesis (H2). Lindblom & Mustonen (2016) mentions that the suburban population is more active in the C2C trade in Helsinki. This means that in the participation and use, there should be a clear regional pattern. Studies also show an urban-rural divide in internet access, which is also perhaps related to e-commerce (Sarkar et al., 2017). Lindblom & Mustonen (2016) also mention that women are more active in the C2C commerce. These findings justify the claims in my third and fourth hypothesis (H3 and H4).

3. Methods

3.1. The structure of the study

This study was conducted in three stages. Starting with 1) data processing, consisting of the extraction and filtering of the data sources, followed by the 2) the data analysis, including spatial and non-spatial quantitative methods and finally 3) the interpretation of the data and results. These steps are more in detail in the flowchart in figure 2.

The data processing part was done with gathering the necessary statistical data from many sources, and followed up with making the decisions what should be used and was relevant for the purposes of conducting this study. These stages resulted in a summary data that will be described in the following section. The most important step in the data analysis part was choosing the statistical methods, and focusing on the quantitative methods. The results were evaluated with regard to earlier studies and the background of the C2C e-commerce.

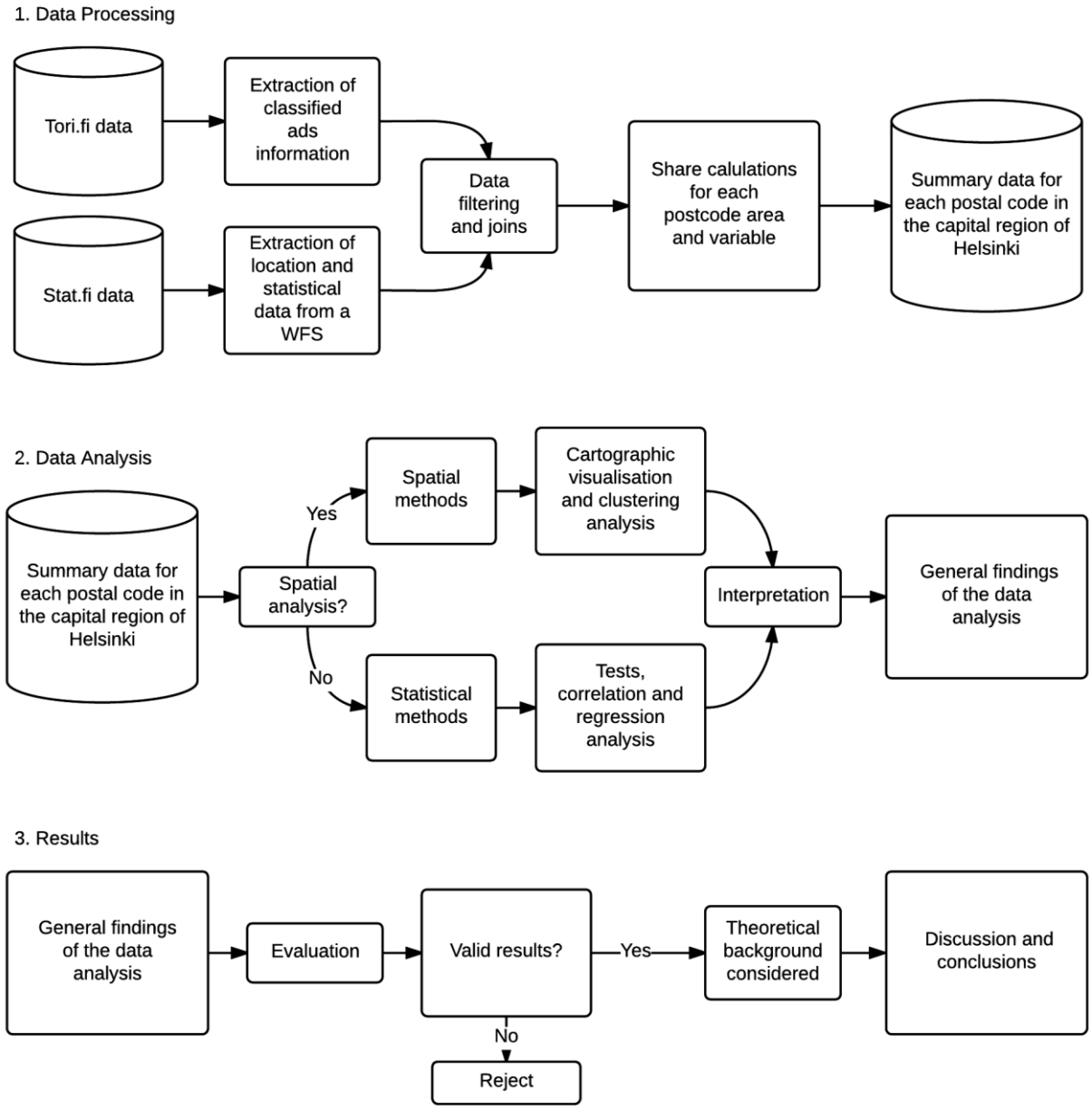

Figure 2. Flowchart of the methods and workflow in this study.

3.2. The research area

The research area for this study is the capital region of Helsinki, Finland (figure 3). This region consists of the municipalities of Helsinki, Vantaa, Espoo and Kauniainen, with a population of 1 138 700 in 2016, which is 21% of the population in Finland (Espoon kaupunki, 2016). This region was chosen for the study, since it represents well the

urban population of Finland. The capital region of Helsinki is also growing faster than the rest of Finland (Statistics Finland, 2016b; Tikkanen & Vuori, 2017) and reflects the future socioeconomic tendencies of the population, with for example migration in mind. There are also comprehensive studies about the demography and development of the region, as well as data. In the C2C e-commerce, the capital region of Helsinki is also well represented and has a wide-ranging use, which gives a good picture of how the C2C e-commerce is conducted in the Finnish context.

In comparison to other cities in Finland (with more than 50 000 inhabitants), the Helsinki region is unique in a few aspects. The higher share of the highly educated, immigrants and the better employment rates are key features in the capital region of Helsinki. These properties can also be seen in the other Nordic capitals, and are mainly caused by the structural development and growth of the economy in the cities (Musterd, Marcińczak, van Ham, & Tammaru, 2017; Vilkama, Lönnqvist, Väliniemi-Laurson, & Tuominen, 2014).

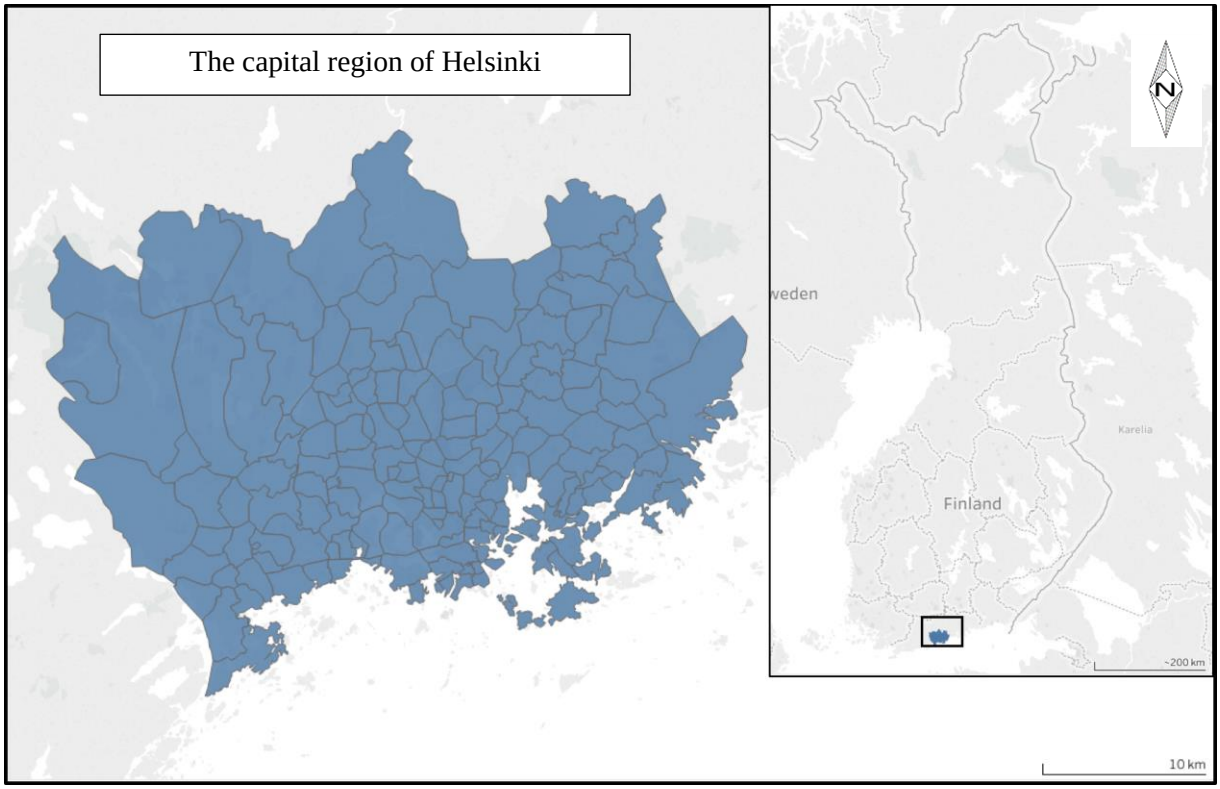

Figure 3. The research area displaying the postal code areas in the capital region of Helsinki and its location in Finland.

3.3. Description of the data

In this study, I have used data from two sources, combining them to one dataset for analysis. The first data used is the classified ad content data from Tori.fi (table 1). Tori.fi is the biggest C2C e-commerce platform in Finland, with a total of 8.9 million classified ads in 2016 (Tori.fi 2017), where a substantial number of ads (1.9 million) are from the capital region of Helsinki. Therefore, this data exemplifies well the C2C market that is being researched. The content data from the whole of 2016 has been used and summarised per postal code region. To filter out professional users, that might distort the data, only private classified ads and users have been considered in all analysis. For the price information of the ads, the marketplace vertical of Tori.fi was selected, which consists of the main categories and subcategories seen in appendix 1**.** This was done to give a more realistic price range of the items that are sold, when the car and the real estate categories were not present. This is also the largest vertical in Tori.fi, having data to represent every postal code in the research area. It also better reflects the day to day user interaction, which is of interest. The descriptive statistics of the main Tori.fi data variables (in table 1) (including outliers) can be seen in appendix 4.

The other data source that was used for the analysis is Statistics Finland's open statistical data named Paavo (Statistics Finland, 2017a), which was extracted from a Web Feature Service (WFS). This data is by postal code area in Finland, and the latest data was used (published early 2017) for this study. The data contains key statistical figures of the research area: "Paavo contains data on the population structure, the degree of education, the income of the inhabitants and households, the size of households and life stage, buildings and dwellings, workplaces, and the main activities of the inhabitants." (Statistics Finland, 2017a). A detailed description of the data content can be seen in appendix 2. This data also contains spatial data, with the borders of each postal code area in the EUREF-FIN coordinate system (ETRS89-TM35FIN), which was used in the location analysis.

The raw data in the Paavo-dataset (Statistics Finland, 2017a) is in absolute numbers, showing for example the exact number of inhabitants in a certain age group by postal

code area. To be able to analyse this data correctly, shares were calculated for each variable, to minimise the distortion absolute numbers would produce depending on the areal size, population or buildings in the postal code. The shares were calculated using the same data reference as in which the data was derived from. This means that the shares were calculated using data from the same year and group, with shares of the population or shares of the households in the postal code regions. A careful description of each variable in this Paavo-dataset can be seen in the appendix 3, where also the shortened names are presented, which were used in the analysis as well.

Table 1. Dataset descriptions and variables.

Dataset	Variable Name	Description	Contents	Notes
Tori.fi	adsuser	Ads per user	Summary data of classified ads divided by number of distinct users in the postal code region 2016 in Tori.fi.	Measured to determine user activity in Tori.fi, private users, all categories.
Tori.fi	mp_gd_pric	Price per sold ad	Summary data of the price of the sold marketplace vertical classified ads divided by the number of sold marketplace ads by postal code region. 2016 in Tori.fi	Measured to determine the value of the merchandise. Private users, user reported sold items, Marketplace vertical, in euros.
Tori.fi	userspop	Users per population	Summary data per postal code of the distinct users that have posted a classified ad 2016 in Tori.fi divided by the he_vakiy variable of population in the Paavo-dataset.	Measured to determine the number of users of the service in relation to population and participation in the trade. All distinct private users 2016. All categories.
Tori.fi	male_acc	Share of male accounts	Summary data of male accounts divided by total amount of accounts* by postal code region in Tori.fi.	Measured to look at gender distribution of the Tori.fi accounts. Active private accounts. *Only active accounts reported as male or

				female in the service.
Tori.fi	ads_fem and ads_male	Ads per female and male account	Summary data of classified ads 2016 per male and female accounts* by postal code region in Tori.fi.	Measured to look at activity by gender in Tori.fi. Active private accounts. *Only active accounts reported as male or female in the service.
Tori.fi	acc_age	Average age for the users	Summary data of average age of active users with accounts by postal code region in Tori.fi.	Age distribution in the research area. Based on the user-reported birthday in Tori.fi. Active accounts.
Paavo 2017	See appendix 2 and 3	Open data by postal code area in Finland	Background information of the inhabitants and apartments in the postal code regions of Finland.	More info at (Statistics Finland, 2017a).

3.4. Data quality

3.4.1. Accuracy, quantity, and the level of detail in the data

All data used in this study has a postal code level of accuracy, which means that it is generalised to a certain extent, often to a distinct district. The surface area ranges from 63.25 to 0.15 square kilometres, with a mean of 4.94 square kilometres in these postal code regions. This shows that there is quite some difference in the surface area of postal codes in the region studied. However, for this research, the areal size of the postal code region is not too relevant, the number of inhabitants are. The mean inhabitant size of the postal code regions in this study was 6 649, with data ranging from 25 817 to the minimum of 20 inhabitants in the smallest postal code. Only 15 out the 168 postal codes had less than 1000 inhabitants, which means that most of the socioeconomic groups should be represented regionally. The data is consequently not biased because of this generalisation more than what is characteristic for the study area of the capital region of Helsinki, especially when looking at calculated shares, as mentioned in the previous section.

The quality of the data used in this study is excellent, with the summarised data in the Tori.fi-dataset being aggregated out of a very high quantity of classified ads (1.93 million, 2016). Therefore, the calculated summaries per postal code area are accurate and highly comparable amongst each other, especially when it comes to the number of ads and users. The price data is calculated with an average of all the sold marketplace (see categories in appendix 1) classified ads in the postal code areas, which diminish the effect of outliers well, when taking only products sold as well as high quantities of ads' price data into account.

The Paavo-dataset from Statistics Finland (Statistics Finland, 2017a) is an open data source dataset of high quality, with population data summarised on a postal code level of accuracy. The data was updated 31.12.2014 (income data and labour and education) and 31.12.2015 (population structure, size and stage in life of households and buildings and housing) (see appendix 2 for exact details). Perhaps notable in this dataset, with this study in mind, is the data protection policy affecting some of the postal code regions. Subsequently, data is not shown when there are less than 30 inhabitants in a group or less than 10 in the workplace data group. In this study, however, the results are not significantly affected by these regulations, with only a few postal codes affected. Noteworthy is also that addresses do not form postal code area boundaries themselves, which means that the borders in this dataset is usually placed between buildings with different postal codes. This means that the accuracy of the border is greater in more densely populated areas, such as in this study's research area of the capital region of Helsinki. This generalisation of the post code borders does not affect the outcome of this study. Overall this dataset is produced by a public authority, Statistics Finland, and can be downloaded and examined from http://www.stat.fi/tup/paavo/index_en.html, which highlights the credibility of this data.

3.4.2. User generated content

The data used from Tori.fi in this study is so called user generated content (UGC), also known as user created content (UCC). UCC has no commonly accepted definition, however OECD (2007) defines it as: " i) content made publicly available over the

Internet, ii) which reflects a certain amount of creative effort, and iii) which is created outside of professional routines and practices." (OECD, 2007). This broad definition encompasses the C2C e-commerce classified ads analysed in this study, being produced online by the users of the service through a platform (Tori.fi) enabling these to be published.

In this study, the relevant user generated contents are the classified ads, their price and their postal code area and whether the item was sold using the C2C platform. Also, the category is user generated, which is within the marketplace vertical (appendix 1) in the pricing data as earlier mentioned. These categories are used in the analysis of the classified ad pricing, in the mp_gd_pric variable. It is up to the user to insert all this content data of the ads, meaning that if it is wrongly inserted, by mistake or intentionally, it might be unrealistic. However, the ads are moderated in Tori.fi, which should reduce the chance of the ads having unrealistic pricing or being placed in the wrong category. Regarding the ad postal code location, this is harder to monitor, and therefore there might be user generated errors in the data. Only valid postal codes in the capital region of Helsinki were taken into consideration in this study, and thus it inevitably means that some ads inserted from users in this region have been ignored because of invalid postal codes inserted. All the account information, the birthday and gender, is also user generated and might have errors. However, these are more commonly missing from the accounts' data, and therefore, naturally excluded. Finally, one can say that these user generated errors have a minor impact on the analysis because of a) the high quantity of classified ads, b) the effect of the errors on the aggregated data and c) the moderation process of the site. Consequently, this should not be considered a data quality concern, but there might be minor inconsistencies in the Tori.fi-dataset.

3.5. Data assumptions

Finally, there are a few assumptions that I will be making in this study that reflect some of the uncertainties described earlier in the methods section. Firstly, I assume that the users of Tori.fi are representative for C2C trade in the region, although the user

demographics might differ from for example the buy and sell groups in Facebook or other similar sites. I also believe that these users are predominantly reporting the postal code of their residential area when inserting classified ads, and are using distinct user-accounts. These are fundamental assumptions in this study, when looking at the regional structures of the C2C e-commerce in the capital region of Helsinki.

This said, I still expect the Helsinki city centre postal code (00100) to be somewhat biased when it comes to users and ad quantities, and therefore it is also excluded from the userspop variable statistical analysis. I expect this because it could be considered a hub for doing the C2C trade, with a lot of people commuting daily for work or otherwise spending time in the area. This means that the people trading in this area are not necessarily inhabitants of the postal code region in question. Secondly, I assume, even though criticised by some scholars (see Martin, 1996; Openshaw, 1984) that the postal code level of accuracy is sufficient for drawing some conclusions about the inhabitants and household characteristics in the study area. Noteworthy is also that there might be some duplicate users being active in one or many postal code areas because of the option to use the service unregistered (using several email accounts).

As discussed previously about user generated content, I also assume that there are some minor content errors in the Tori.fi-dataset. In the case of missing/incomplete data from the smaller postal code areas, this does not change the results. I also believe that the year of 2016 is representative for C2C trade in the capital region of Helsinki, and that the population and household data, from the Paavo-dataset (Statistics Finland, 2017a), is recent enough to draw valid conclusions about the current situation in 2017. As earlier emphasised, these above-mentioned assumptions should not affect the results in the study significantly.

3.6. Methods applied in this study

After the data processing was finished, the outcome was an aggregated dataset combining the Paavo and Tori.fi data sources on a postal code level in the research area. In this study, I focus on quantitative methods, with correlation, linear regression and

clustering analysis. Interpretation of cartographic visualisations is also done as well as statistical testing. In the following sections I will describe the methods more thoroughly, while motivating the use of these procedures. The technical details of the methods and models used will also be described. The data analysis part of the methods flowchart (figure 2) shows briefly how the analysis was conducted in this thesis.

3.6.1. Spatial methods

The main Geographic information systems (GIS) methods used in this study is clustering analysis and cartographic visualisation with choropleth maps (with the Jenks natural breaks classification method (De Smith, Goodchild, & Longley, 2007, p. 101), with the exception of the gender distribution map (figure 19)). The main goal of this analysis is to find spatial patterns, and explore the characteristics of the research area with C2C e-commerce in mind. For finding spatial patterns or spatial dependencies in the capital region of Helsinki, I have used spatial autocorrelation statistics. Spatial autocorrelation measures how objects or activities are similar to other objects or activities nearby, based on the premise of Tobler's (1970) first law of geography: "everything is related to everything else, but near things are more related than distant things" (Goodchild, 1986; Tobler, 1970). Spatial autocorrelation is a descriptive index that can measure two aspects of spatial relation, how things are distributed in space and how they might influence each other. It is also one of the few techniques that both take into account location as well as attribute data (Goodchild, 1986).

The Moran's Index (Moran, 1948) has been popular for testing data for global spatial autocorrelation, hence testing whether there are spatial patterns in the data. In this context "global" refers to the whole research area and its data. The Moran's Index value is positive when the neighbouring areas are similar, with a maximum of 1, and negative when they are dissimilar (-1). When the value is closer to 0, the data is random (Goodchild, 1986). This spatial correlation is illustrated in figure 4 (Radil, 2011).

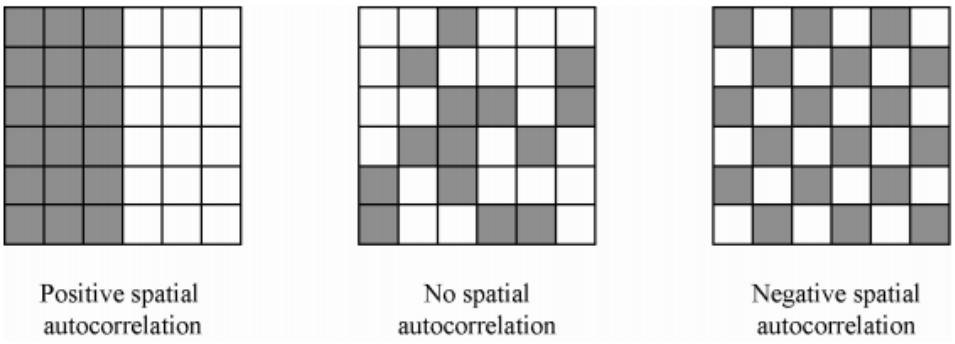

Figure 4. Spatial autocorrelation (Radil, 2011).

However, to find local spatial patterns, which is crucial in this study, methods have been invented to test local measures of spatial dependence (Ord & Getis, 1995). Therefore, another statistical method, apart from the Moran's Index, is applied in this research called Local Indicators of Spatial Association (LISA) (Anselin, 1995). LISA measures local spatial autocorrelation and allows discovering of hot spots and individual areas, in the global statistics, that could be identified as outliers. The usefulness of LISA is, therefore, in exploring spatial data and finding local clusters. This method is especially suitable when there is no global spatial autocorrelation (Anselin, 1995), as in this study (see 4. Results). Consequently, the purpose of using this method is to reveal local clusters of high activity in C2C trade, in the pricing of products sold in Tori.fi as well as users per population. I also use this method for looking at the ads per gender in the service (figure 24 and 25).

For spatial autocorrelation analysis, spatial weights are necessary to build a connectivity matrix. The Queen's contiguity is used as spatial weights for connecting the regions in the LISA analysis. In this case all the neighbouring cells, in all directions, are taken into consideration (figure 5) (Lloyd, 2010). Compared to the Rook's contiguity, which ignores diagonally connected cells, the Queen's contiguity was chosen in this analysis to closer resemble the reality of the research area. To be able to assure that these LISA-analysis results are valid, statistical significance is tested with permutations. Permutations is a numerical approach for testing significance levels in the analysis, that has the advantage of not relying on normal distribution or other assumptions in the data (GeoDa, 2017). This is done with assigning random vectors for each observation and

relocating these in space to test for spatial randomness (GeoDa, 2017). The LISA analysis was done using 9999 permutations with the GeoDa software (Anselin, Syabri, & Kho, 2006; GeoDa, 2003), leaving only the statistically significant results (p-value ≤ 0.05).

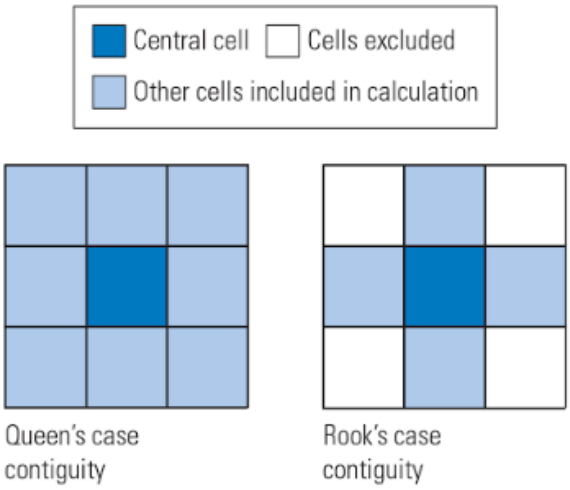

Figure 5. Queen's contiguity compared to Rook's contiguity in spatial data (Lloyd, 2010).

3.6.2. Statistical methods

The non-spatial statistics I have used in this study are correlation analysis, linear regression as well as various tests for validating the analysis. Correlation analysis is used for testing relations between a pair of variables, commonly using the Pearson, Spearman or Kendall correlation coefficient. Since the Pearson correlation is best suited for interval scale data (Heikkilä, 2010), which is used in this data, it is the method of choice for the correlation analysis. The results in correlation analysis vary from 1 to -1, with 1 being perfect positive linear correlation and -1 being perfect negative correlation. A correlation value of 0 means there is no linear dependence (Heikkilä, 2010). Correlation is a good way of determining association between variables of interest, and in this study relevant Paavo-dataset variables (see appendix 3) are tested for correlation with the adsuser, mp_gd_pric and userspop variables from the Tori.fi-dataset (see variable descriptions in table 1). However, it is also important to realise that correlation does not imply causation (Heikkilä, 2010), and therefore, the variables studied are chosen carefully based on earlier studies and theory before conclusions are drawn. Also, potential external influence on the correlations is considered. Notable is that the

correlation values might vary based on the type of data used, sample and field, for example social science data may require weaker correlation values for it to be meaningful (de Vaus, 2002, p. 272). The correlation scatterplots and values as well as their statistical significance can be seen in the results section (figures 27-29, tables 2-4).

Regression analysis is a statistical technique to investigate and model relations between variables, and it is widely used in many fields of science. The general idea of the regression analysis is to find out how an independent variable is related to the dependent variable(s) (Cohen, Cohen, West, & Aiken, 2003; Heikkilä, 2010; Montgomery, Peck, & Vining, 2012). With the linear regression analysis, in this study, the aim is to find the dependent variables, in this case the variables from the Paavo-dataset that predicts or explains the independent variables the best. The independent variables in this study are the adsuser, mp_gd_pric and userspop from the Tori.fi-dataset (seen in table 1), measuring the activity of the users of the service as well as the pricing of the classified ads and Tori.fi users per population. The results of the linear regression models are expressed in a coefficient of determination ranging from 0% to 100%, describing how well the dependent variables explain the independent variable in the model.

There are also some data assumptions that have been taken into consideration in this study when using linear regression analysis. Some of the key statistic assumptions are the following (Field, 2009; Hayash, 2000): 1) Assumption of linearity, the dependent variables are linear with the independent variable. 2) Strict exogeneity, the variables are causally wholly independent from the others (Little, Lewis-Beck, Bryman, & Liao, 2011), 3) No multicollinearity, meaning that the dependent variables do not highly correlate with each other in the model, 4) No spherical error variance (homoscedasticity), meaning there is no variance in the residuals in the model (Fay, 2012) and lastly 5) Assumption of normality, the data at hand is normally distributed.

To be able to determine whether these assumptions apply to the regression models used in this study, statistical tests and evaluation have been made. The assumptions of

linearity and error variance (assumptions 1 and 4) have been validated by examining the regression scatterplots (figure 31, 33 and 35), where one can see that there are no irregularities that would compromise the model. For validating the normal distribution of the datasets (assumption 5), I have done graphical tests (figures 6-13) consisting of histograms and Q-Q plots (quantile-quantile plot) that confirm the statistical assumption made. In the mp_gd_pric variable we can see that there is an outlier value (Suomenlinna, postal code 00190) (figure 8), which has been removed from the regression model 2 (figure 32) to comply with the normality assumption. The userspop variable has 7 outliers identified by the graphical tests (figure 11), which are removed from the regression as well as correlation analysis (postal codes 00100, 00290, 00590, 00880, 01530, 01720 and 01740). To meet the requirement of "strict exogeneity" (assumption 2), the variables used in the regression models have been carefully selected based on theory and hypotheses of the study, with this assumption in mind. The variable-correlations have also been statistically examined and determined to not be correlated internally. All the regression models have significant P-values, both in the ANOVA test for variance and in the regression coefficients. Field (2009) propose that values lower than 1 and higher than 3 are a cause for concern in the Durbin-Watson test, with some exceptions depending on the sample size and data at hand. The Durbin-Watson test values seen in the regression models 1 and 2 (figures 30, 32 and 34) are within the range of what is suggested in the literature (Field, 2009, p. 220) to be feasible, to determine that there is no autocorrelation between variable residuals in the models.

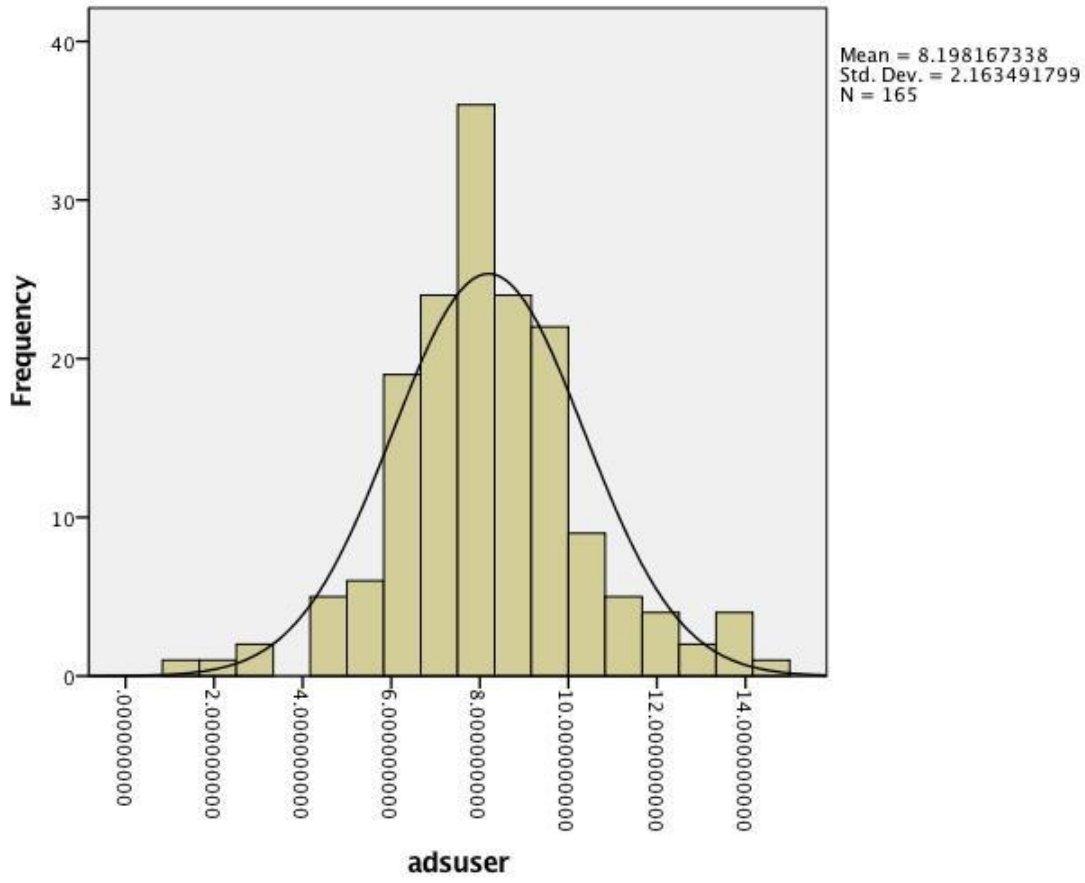

Figure 6. Histogram of the adsuser variable. We can see that the data is normally distributed.

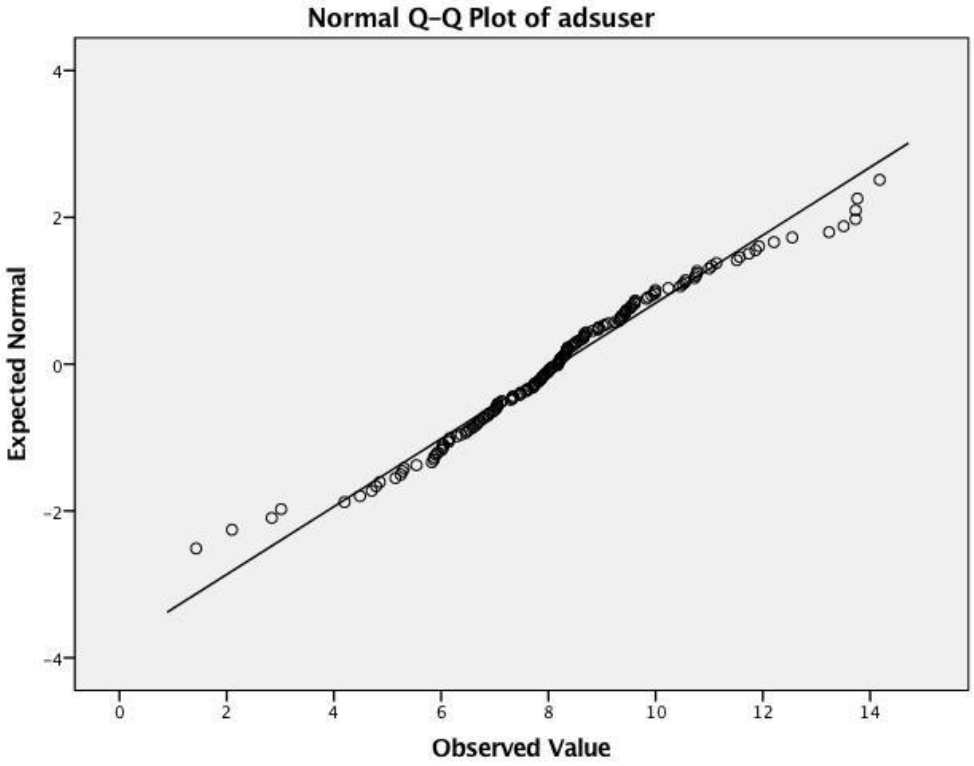

Figure 7. Normal Q-Q plot of the adsuser variable. This confirms the normal distribution of the data.

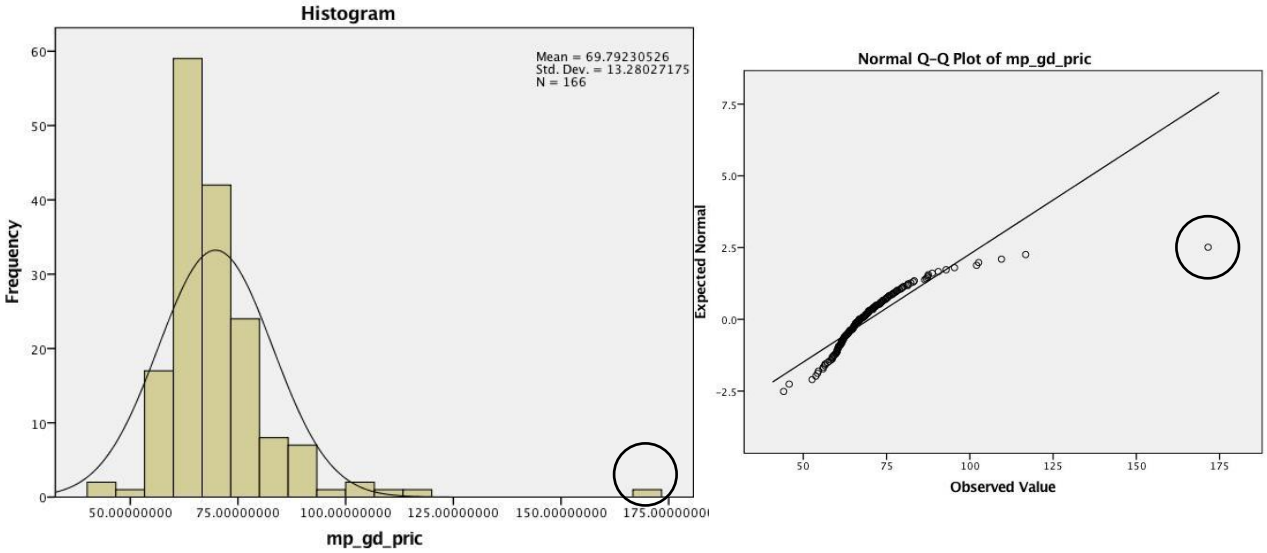

Figure 8. Outlier identified in the histogram and Q-Q-plot of the mp_gd_price variable, marked with a circle.

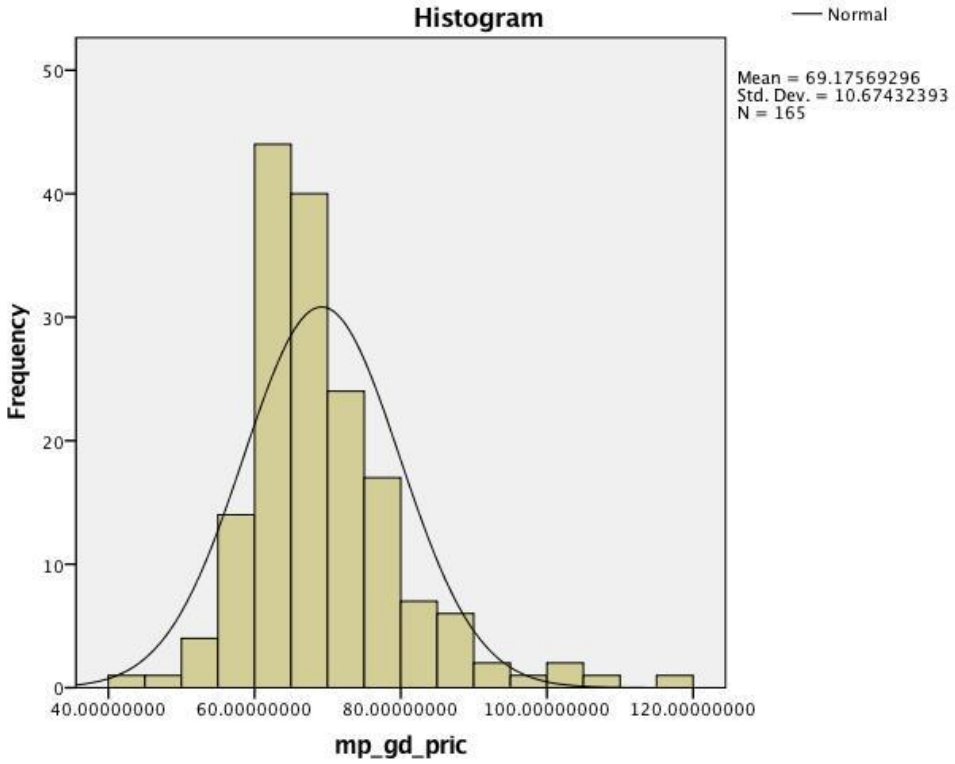

Figure 9. Histogram of the mp_gd_pric variable with outliers removed. As seen, there is close to a perfect normality in the data after the removal of an outlier.

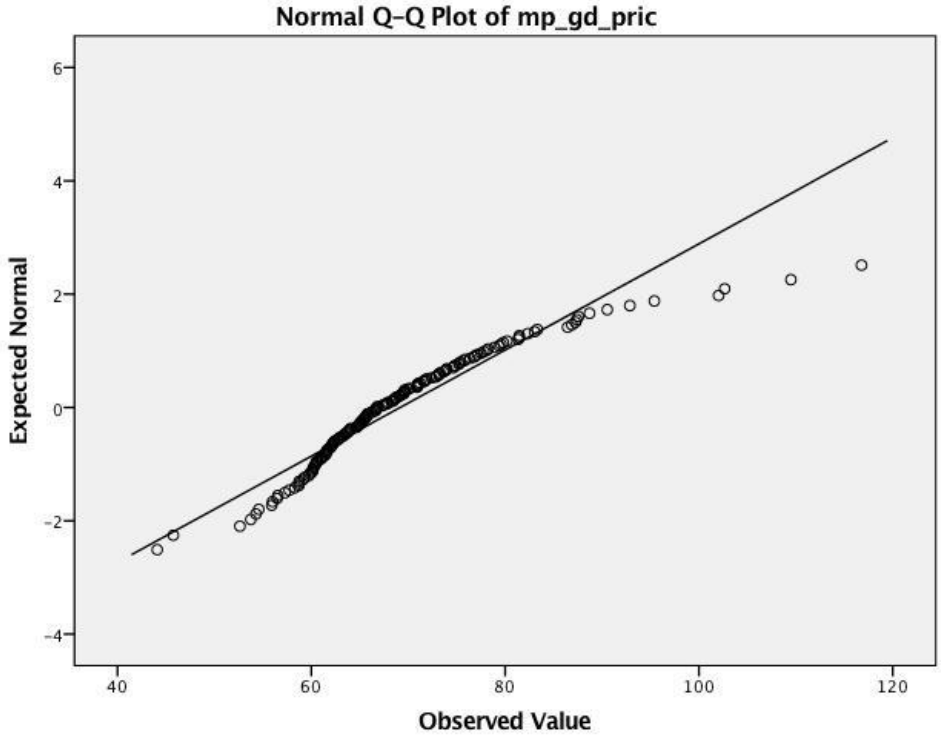

Figure 10. Q-Q plot for the mp_gd_pric variable with outliers removed.

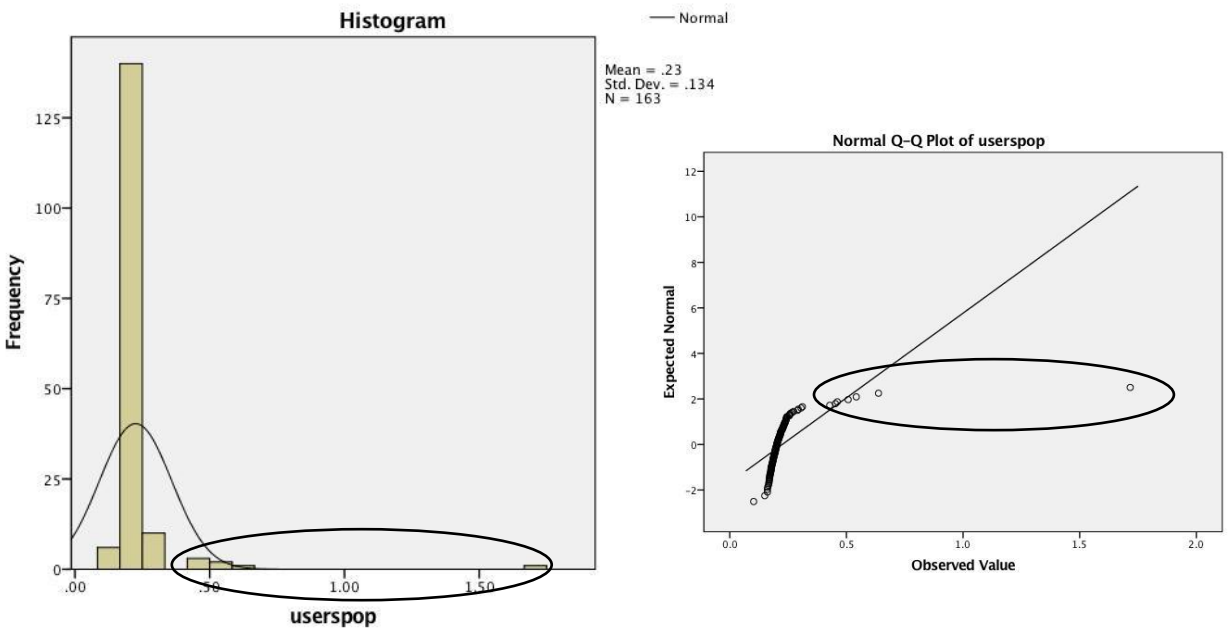

Figure 11. Outliers identified in the userspop variable displayed in a histogram and Q-Q plot, marked with an oval.

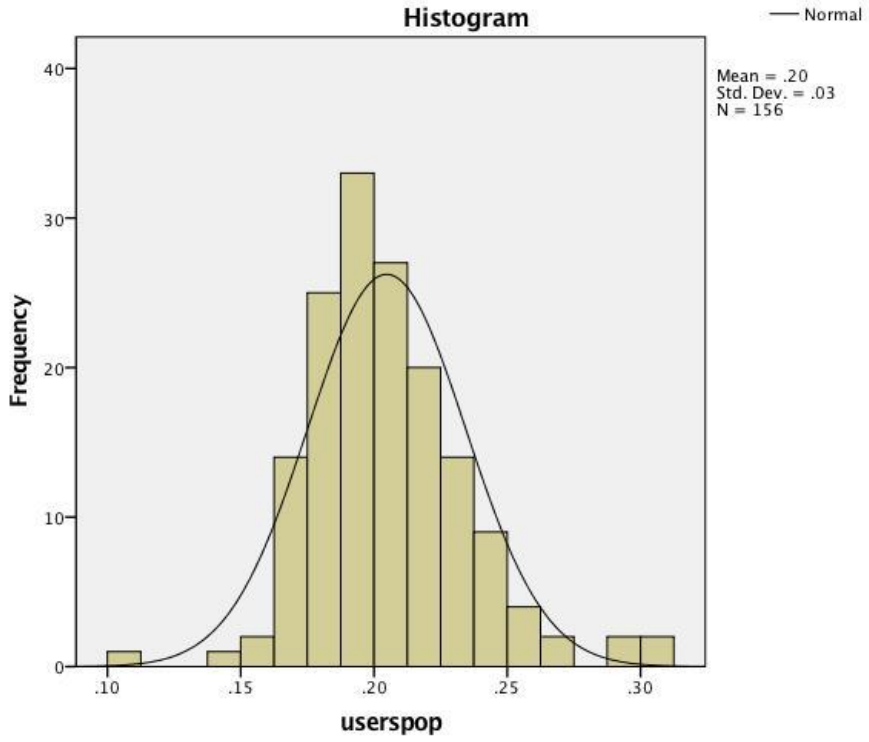

Figure 12. Histogram of the userspop variable with outliers excluded. The data is distributed normally in this variable after the removal of outliers.

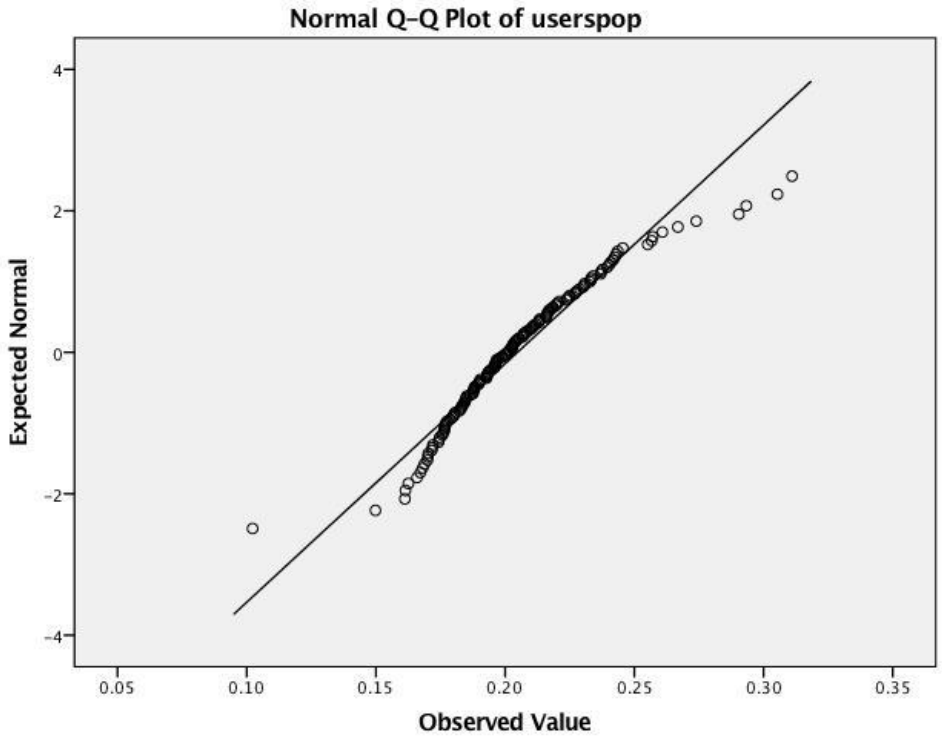

Figure 13. Q-Q plot of the userspop variable with outliers removed.

4. Results

In this section I will display the results of the methods described above as well as answer the research questions. In the methods flowchart (figure 2), under 3. Results, the workflow conducted can be seen. This process consists of presenting the figures and numbers, as well as evaluating and validating the results. Finally, the results will be critically discussed. I will start with presenting the general results as well as the key figures of the C2C e-commerce in the research area, and thereafter I will move on to the more specific spatial analysis and statistical methods. The names and descriptions of the variables used can be seen in table 1 as well as the appendices 2 and 3.

4.1. General findings of the data analysis

The research question “Are there regional structures in the C2C e-commerce in the capital region of Helsinki?” is answered in this section and can be validated when looking at the figures describing both the users and use of Tori.fi. We can see that there are regional patterns in the variables, clearer in some cases, when looking at the

choropleth maps (figures 16-20) and the cluster maps (figures 21-25). While this spatial analysis answers the first research question, the second research question: "Does the socioeconomic status of the inhabitants determine the use of C2C e-commerce services in the study area?" – is answered predominantly with the statistical analysis.

The general findings of the spatial analysis are that there is a clear difference between the inner-city and suburban postal code areas what comes to activity in the C2C trade, the pricing and user distribution (figures 16-18). Yet, the demographics of the Tori.fi users are more bound to the actual demographics of the region rather than this division (seen in figures 19-20). This does not, however, mean that there are no patterns in the demographics – the inner-city – suburban divide is just not as clear. Interestingly, the results in this study show that men seem to have more accounts in the online C2C e-commerce when looking from a regional perspective (figure 19). We must in this case, with the statement above in mind, remember that we are looking at regional shares of users, rather than absolute numbers of users with a certain gender or age (compare to figures 14 and 15).

The statistical analysis reveals similar general patterns that indicate the inner-city and suburban division. This is mostly related to the type of housing, the household size and stage of life that shows typical characteristics of the suburb as well as the inner-city. For example, this could be a larger household size in the suburb and respectively smaller in the inner-city. These characteristics explain to a certain extent the use the C2C as a form of trade, which trends and can also be seen in the analysis and models below. Generally, the results show that the shares of certain age groups and households with children as well as the highest education attainment seem to be factors for the use of the C2C e-commerce in the Helsinki capital region, when looking at the Tori.fi-dataset variables (table 1) adsuser, mp_gd_pric and userspop. The factors that seem to be underlying the use of the C2C trade are described in more detail in the following chapters. Notable is also that there are socioeconomic factors that do not, perhaps surprisingly, influence the use of the C2C trade in this region. This will also be more thoroughly exemplified in the following chapters. To conclude, the statistical results in this study show that there is no single dominant reason for participation in the C2C e-

commerce. But then again, many socioeconomic and demographic factors stand out significantly in this study.

4.2. The users of Tori.fi

To be able to comprehend the results of this study, it is important to realise what kind of key figures there are for the Tori.fi users and the population in the capital region of Helsinki. The average age of the Tori users is (acc_age) 42, slightly higher than the average of the study area's population of 39 years. Figure 14 shows the age distribution histogram of the Tori.fi users, and we can see that the age groups from 40–44 are the most common, with a few outliers with lower average age. Since the acc_age variable only considers the voluntarily reported age, and the user base of the service does not have all age groups present, the younger and older groups are naturally excluded. However, these averages show how the Tori.fi users correspond to the population averages quite well. The gender distribution of the study area can be seen in figure 15, with 53% male and 47% female accounts. These figures are also close to the numbers of all accounts in Tori.fi in Finland, with marginal majority of male accounts. Notable is that the biggest share of the users do not have their account gender defined in the study area, and the users without accounts cannot be taken into consideration in this study.

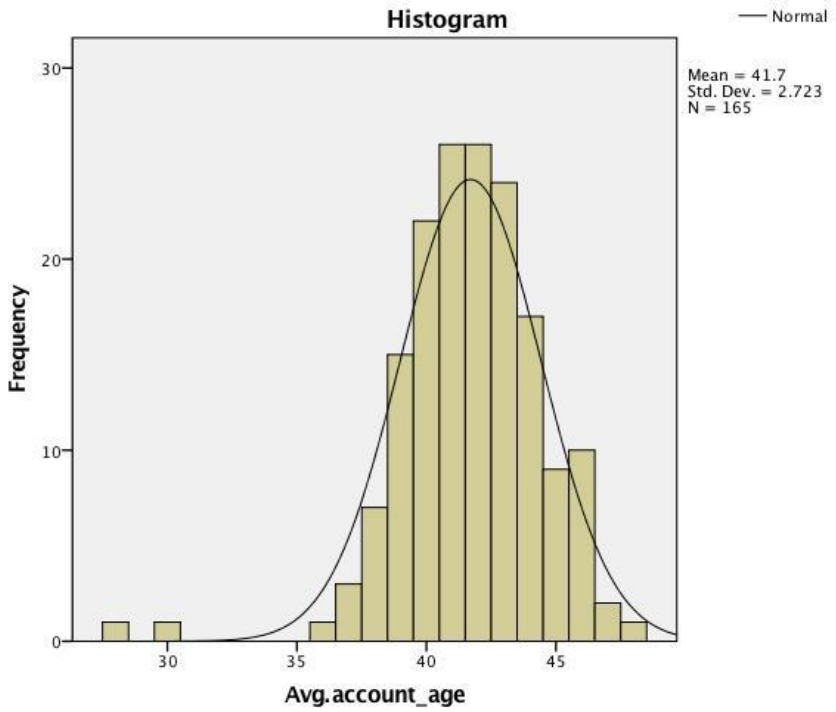

Figure 14. Histogram of the average age distribution of the users in Tori.fi in the capital region of Helsinki.

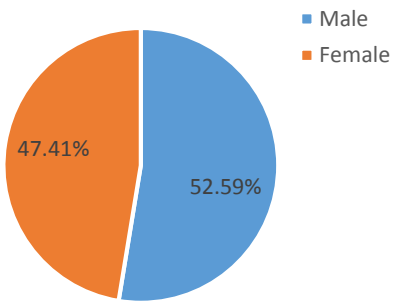

Figure 15. The gender distribution of the Tori.fi accounts in the research area.

In the capital region of Helsinki, the average population of the postal codes is 6649, while the average number of Tori.fi-users is 1373. This means, on average, that roughly 20% of the population in a postal code area, in the research area, were Tori.fi-users in 2016. This is a good indication of how popular this form of trade is, as well as how high penetration this service has in the region. These users insert on average 8.23 ads per year per person (adsuser, year 2016), and the average price of the sold ads in the

marketplace vertical (appendix 1, mp_gd_pric) is 69.62 euros. These averages are a good baseline for studying the following figures, showing the regional patterns of the use and users of Tori.fi. The maps of ads per users (figure 16); price per ad (figure 17) and users per population (figure 18) variables describes well the regionality of the service, while the rest (figures 19-20) describes the users' regional properties.

Figure 16 of the ads per user shows that there is a regional pattern in the capital region of Helsinki, where the inner-city (southern area, located in the centre of the map) has lower activity than the suburban areas in the C2C e-commerce. There is also a concentration of high activity in the C2C trade in the north-east parts of the study region in Vantaa, which also is identified as a cluster when looking at the spatial analysis in figure 21. Generally, the differences in the classified ads per users are ranging from 0 to 11 per postal code per user 2016, which means that the activity is quite even in the whole region. Although, with the underlying data quantities in mind, as discussed in the methods section, the differences are significant even though single user's high activity might influence the results shown. When looking at the price per ad figure (figure 17), this inner-city – suburban divide is clearer, although there are regions in the proximity of the city as well as the outskirts of the research area that have resembling ad pricing averages. Interestingly one can visually see the relationship ads per users has with the pricing of the ads, with seemingly lower average prices where there are on average higher ad quantities per user. This relationship will be discussed more in the correlation analysis section (4.4.).

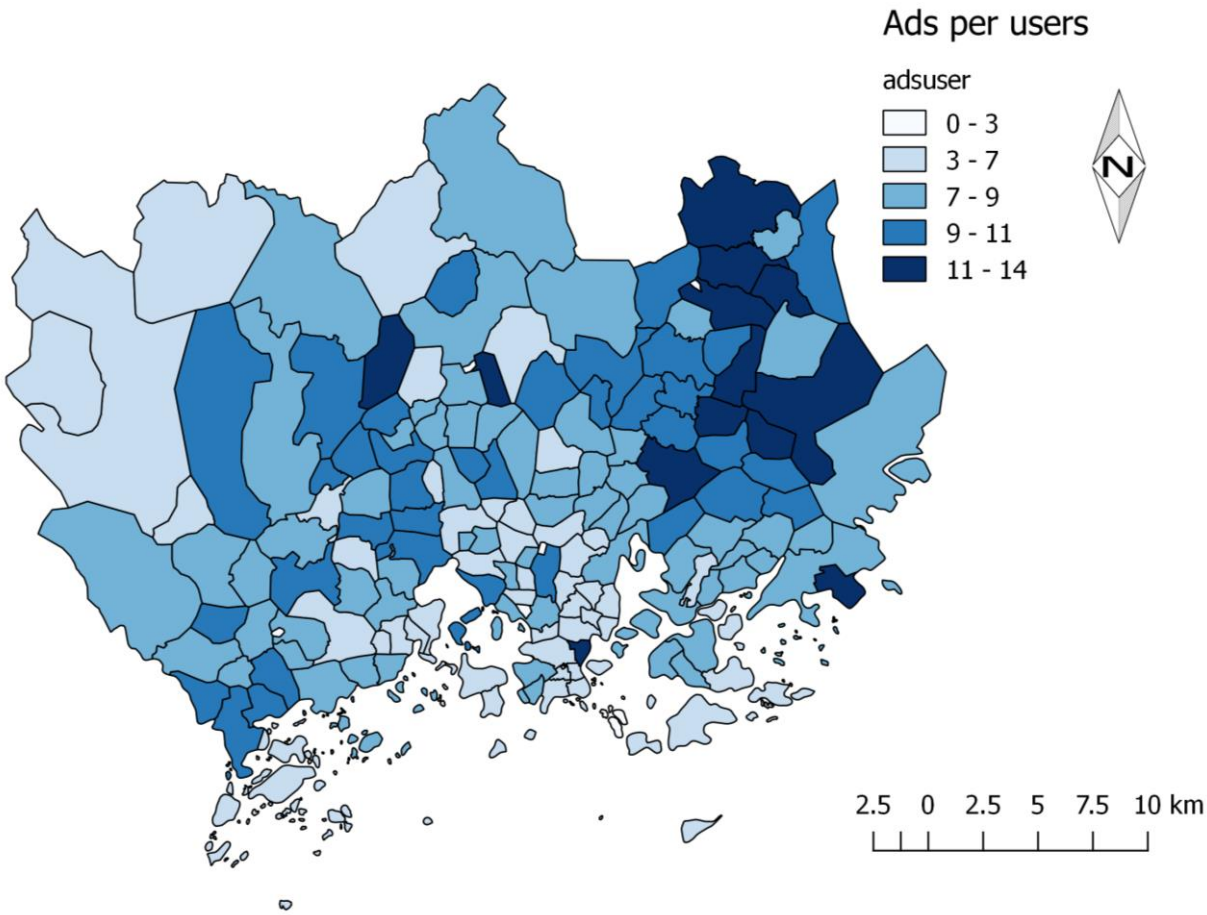

Figure 16. Ads per user in the research area (2016). Classified with natural jenks. Note that in the classification of figures 16-20, the decimals are removed from the legend, and although the values are the same in two categories, the second categories' values are always strictly above the starting value of that category.

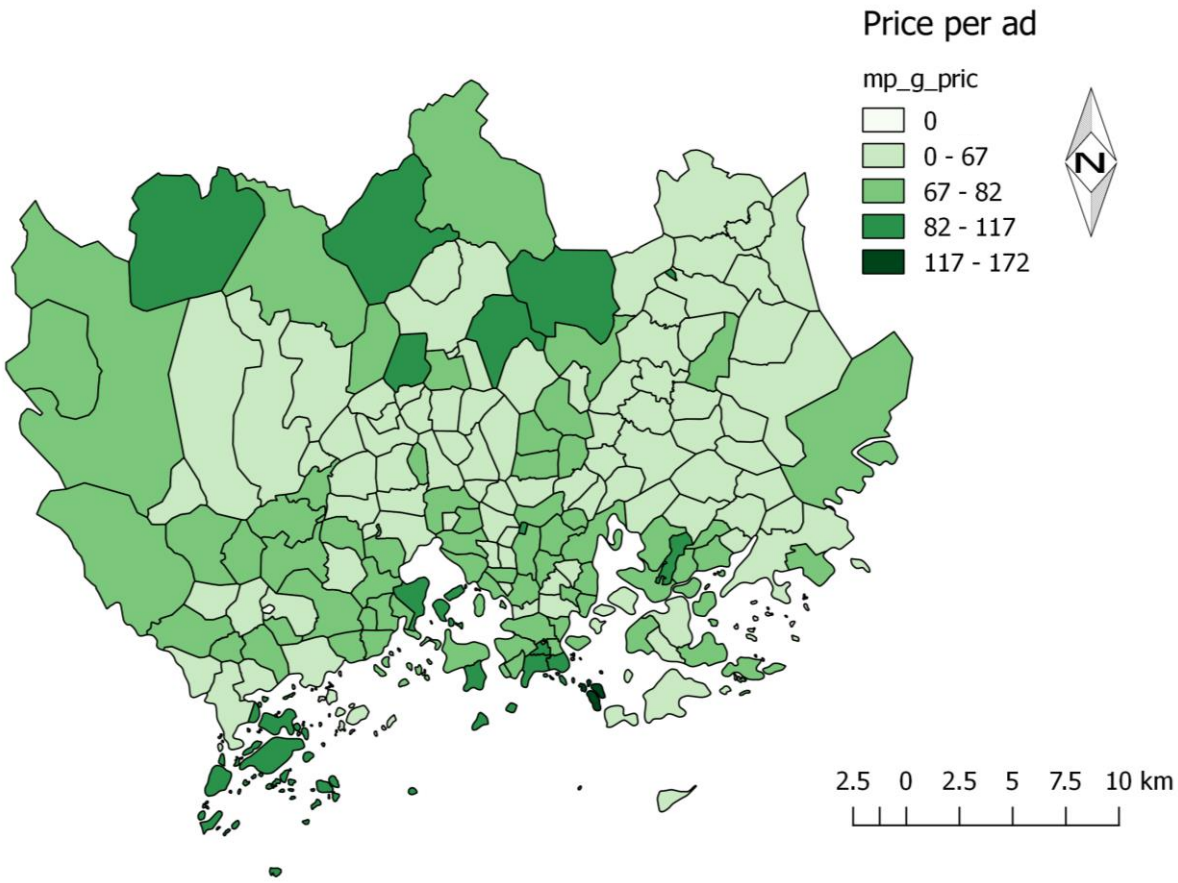

Figure 17. Price per sold ad in Tori.fi in the capital region of Helsinki (2016). Classified with natural jenks. Note that in the classification of figures 16-20, the decimals are removed from the legend, and although the values are the same in two categories, the second categories' values are always strictly above the starting value of that category.

In figure 18 of the users per population the divide between the city centre and the suburban area is also visible, with more users in relation to the population in the proximity of the city centre. This might partly be caused by the role of this area as a hub for the C2C trade as discussed earlier (see 3.5. Data assumptions). As figure 16 of the ads per user shows, this inner-city region is less active when it comes to C2C trade, although there are more users per population. This behaviour might be related to the consumer goods sold in this specific area, which also the price per ad figure indicates, with higher average prices of sold merchandise. This is also a challenge when looking only at the ads per user as a measure of activity, when every single item is as "influential" with this metric despite the category of the product. Espoo in the west of study area could be considered an area of interest, with high activity (based on the adsuser variable) as well as higher price per sold ad (mp_gd_pric). These results might also be related to the socioeconomic structure of the capital region of Helsinki, with

different consumer patterns depending on the user's background. Although, on the contrary, measuring participation with the number of users per population validates this above-mentioned suggestion. The users per population variable explains, in this context, better the participation in the C2C e-commerce.

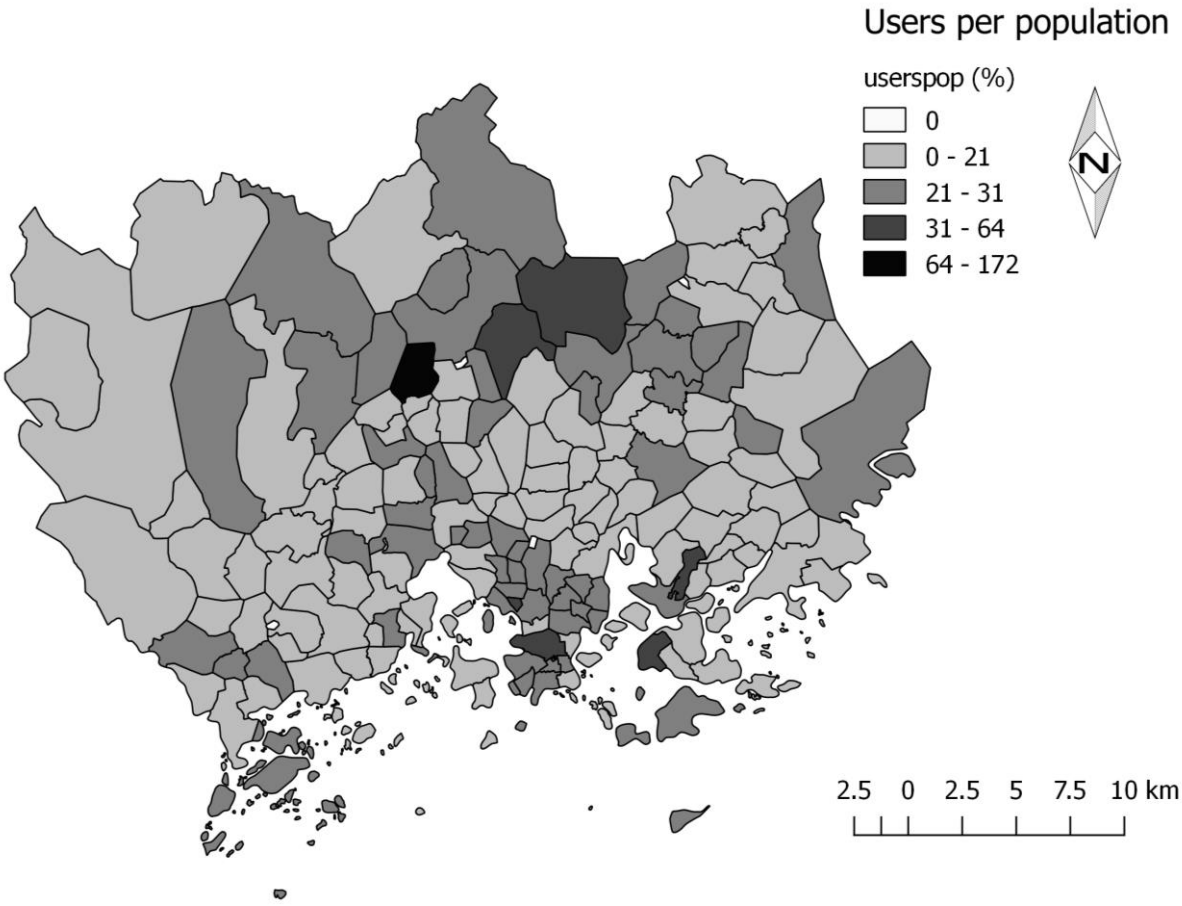

Figure 18. Percentage of users per population in the research area. Classified with natural jenks. Note that in the classification of figures 16-20, the decimals are removed from the legend, and although the values are the same in two categories, the second categories' values are always strictly above the starting value of that category.

In figure 19 the share of male accounts is displayed (male_acc variable), to illustrate the regional structure of the gender of the users. In the classification, I have used custom groups to better highlight the regions where the share of males and females are overrepresented. The group from 49%–51% is to display postal codes where the gender distribution is even. Naturally, some of this variation might be caused of the population demographics, which affects the results significantly. There are higher shares of males in most of the postal codes, which was also seen in the total amounts of accounts in

figure 15, which means we can draw the conclusion that most users in Tori.fi are men in the capital region of Helsinki. Eastern Helsinki has a concentration of higher shares of females, which might be related to the areas social characteristics, but most likely related to the gender structure in this area (Statistics Finland, 2017a). There is a minor concentration of postal codes with an even share of male and female accounts in central and north parts of the research area.

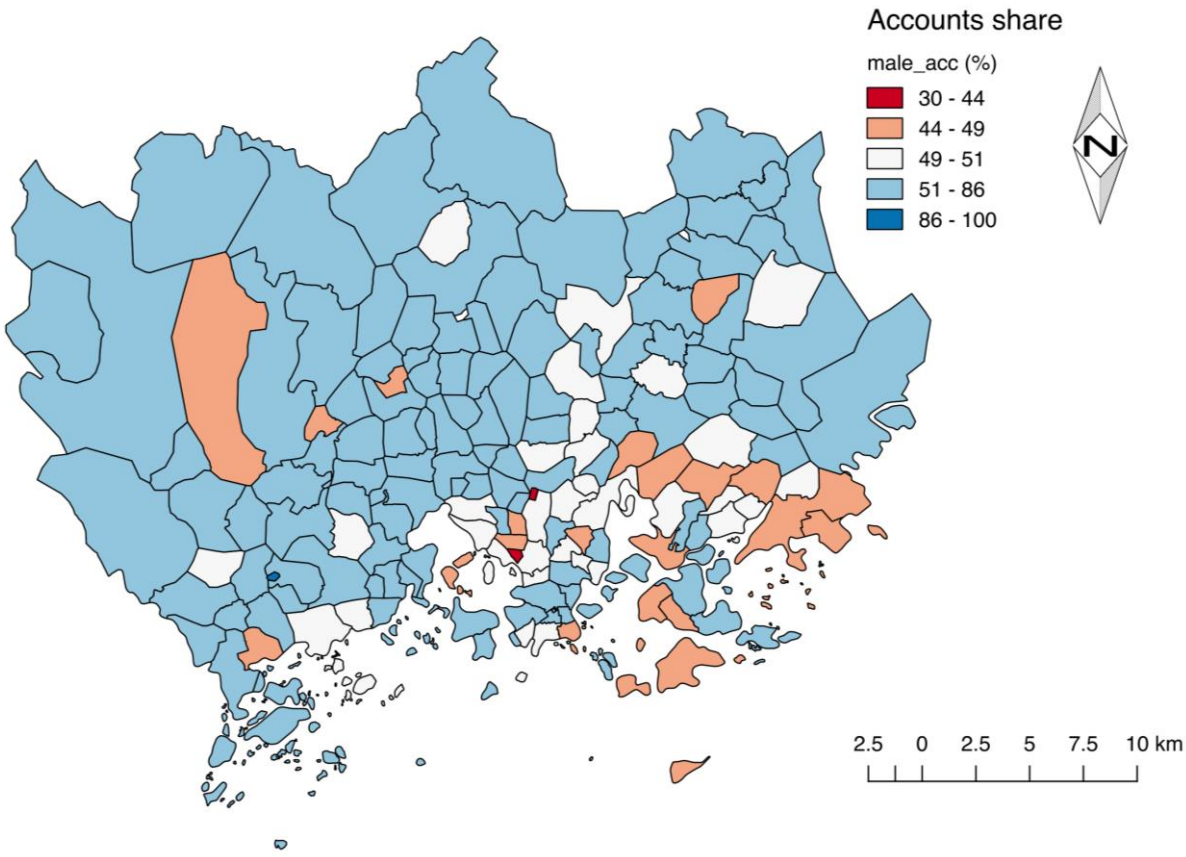

Figure 19. The share of male Tori.fi accounts. Classified manually. Note that in the classification of figures 16-20, the decimals are removed from the legend, and although the values are the same in two categories, the second categories' values are always strictly above the starting value of that category.

The regional average age of the Tori.fi users are shown in figure 20. As with the genders, the average is also related to the demographics of the study area, with even more influence on the results in this case. As we also can see from the histogram (figure 14), the differences in the average ages are minor in the postal codes, which can be seen clearly in the classification of the map in figure 20. However, as previously mentioned, there are a few outliers, for example in Otaniemi (postal code 02150) that has a large

share of students living in the area and in the smallest postal codes. The key result, regarding the average age of the Tori.fi users, is that there is no substantial regional pattern, except for a clear younger average age in the city centre. Otherwise there are no clearer clustering shown, and only a few areas with older average age in the suburban region.

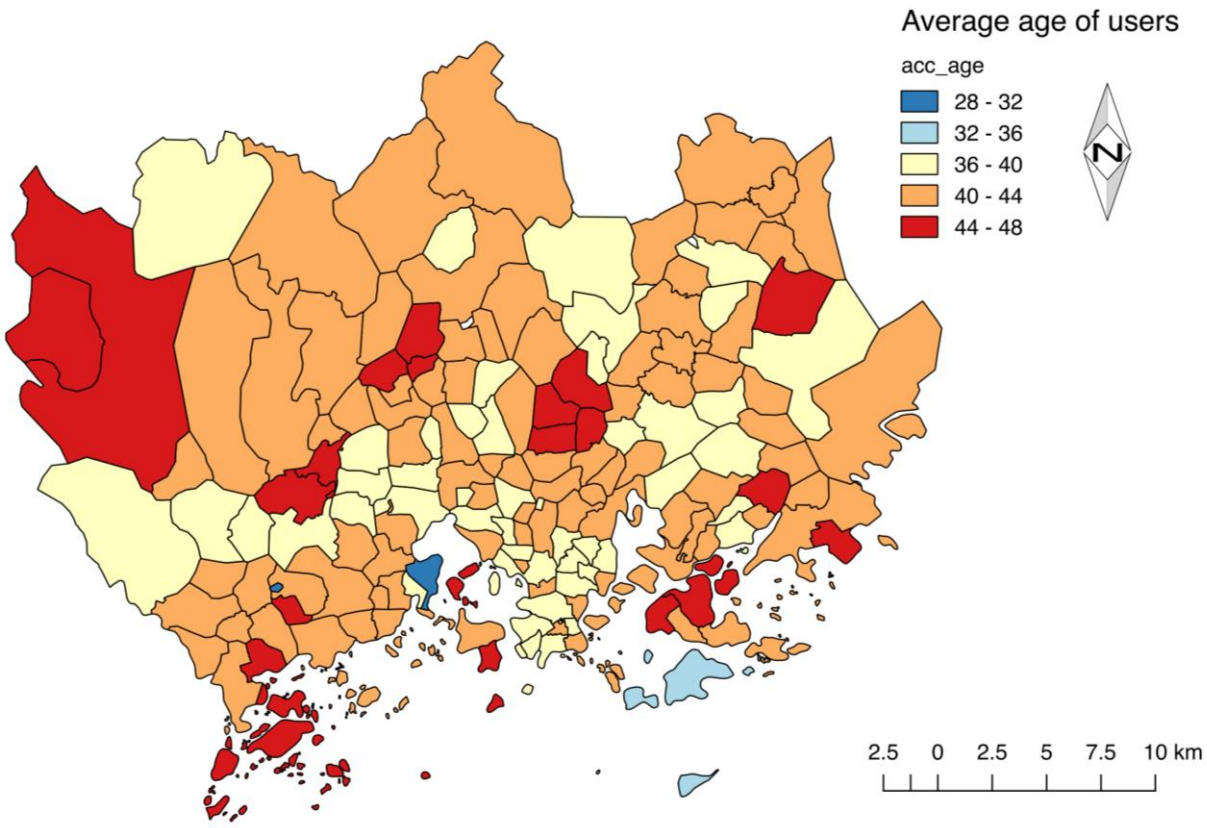

Figure 20. Average age of the Tori.fi users with accounts. Classified with natural jenks. Note that in the classification of figures 16-20, the decimals are removed from the legend, and although the values are the same in two categories, the second categories' values are always strictly above the starting value of that category.

4.3. Spatial clustering of the C2C e-commerce in the research area

The spatial analysis in this consists mainly of clustering analysis, where the patterns visible in the choropleth maps are validated and closer exanimated. However, before I go into the local clustering seen in the following figures, it is important to view the global spatial autocorrelation. This is done with the Global Moran's Index, ranging from +1 to -1 (explained in the methods section (3.6.1.). The results show that there is none or little positive global spatial autocorrelation in the use, pricing and location of users in

the C2C e-commerce platform Tori.fi in the research area. For the adsuser variable, this value is 0.164682, the value is 0.0835412 for the mp_gd_pric variable and 0.0314513 for the userspop variable. This means that when looking at the study area, these variables are not significantly concentrated with similar values close to each other. It is also good to know that these values are not negative, which would indicate that higher values are proximate to low values and vice versa. These global autocorrelation results, therefore, indicate that the distribution of the values in the research area is random.

With this said about the global statistics, the local spatial autocorrelation analysis describes better the areal clustering of the variables, which in this case shows many significant clusters for all the variables analysed. In the following figures (21-25), the same variables are analysed as described above, except for the male_acc variable, which is replaced with separate variables for the genders (ads_fem and ads_male). The ads_fem and ads_male variables are used in this case to measure the activity of the users with a certain gender, to see where the males and females are most active in the research area.

In figure 21 the adsuser variable is described with the LISA clustering analysing method. We can see that there is a significant cluster of high activity in the north-eastern part of the research area, as was already seen in the choropleth map in figure 16. What was not revealed as clearly by the earlier figures, is the region closer to the inner-city, where there is a significant clustering of lower activity (lower values of ads per user). There are also some interesting regions with higher and lower values next to each other, for example to the east low-high area, showing high contrast within the research area. Respectively, there are a few high-low areas in the south. This analysis confirms the inner-city – suburban divide that was mentioned earlier, however, there are not that many significant clusters overall.

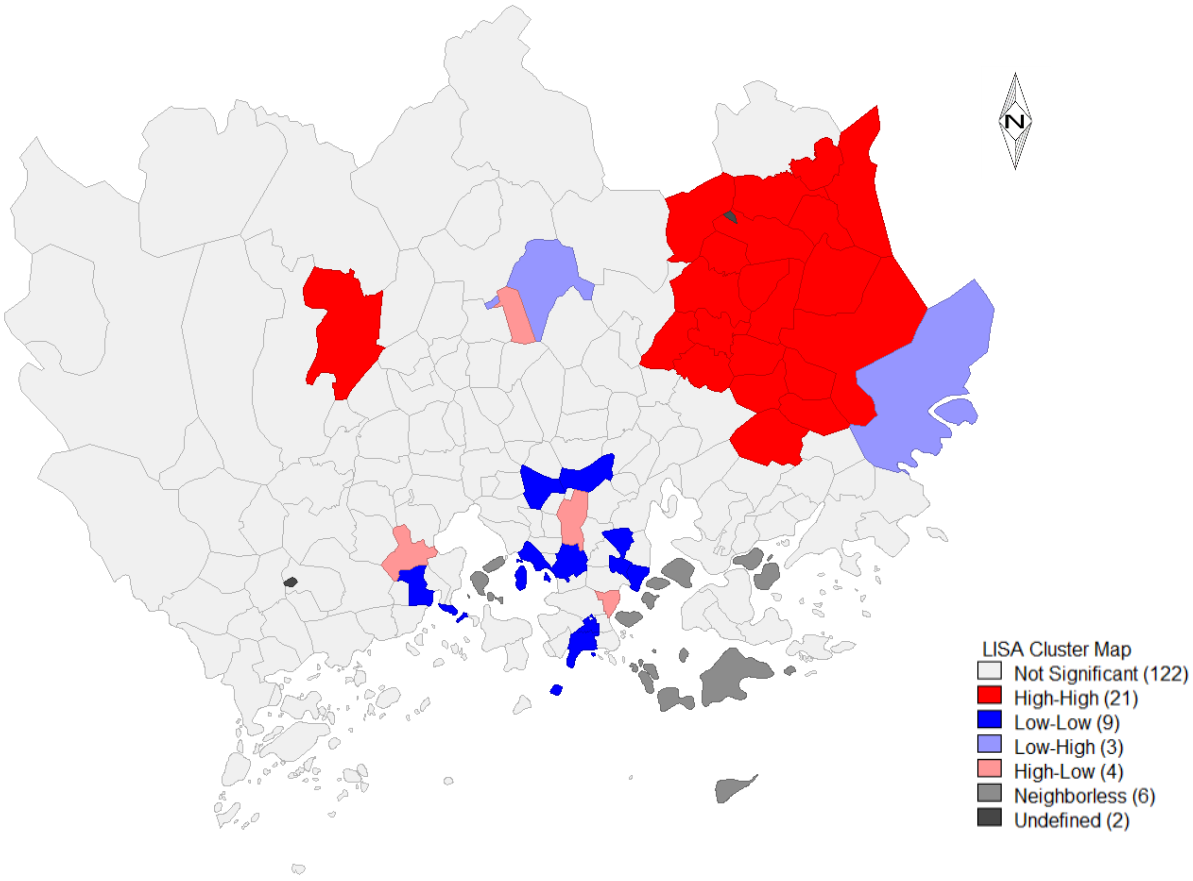

Figure 21. LISA cluster map of ads per users (adsuser). A clear high activity cluster can be seen in the north-east.

In the next figure (figure 22) the mp_gd_pric variable is analysed using this same LISA clustering method. From this figure, we can see some clusters with low-low values, meaning that there is a concentration of lower average prices per ad. The analysis shows that there is no clustering in the city area, while the area in the north-east, with unusual high amounts of ads per user, has larger areas with significantly lower price per ads. Interesting is also that the western area (Espoo), that stands out in the figures 16 and 17 with high activity (adsuser) as well as higher average price, does not have significant clustering. The northern part of the research area seems to be a mix of significant higher and lower values clustering, meaning that this has a versatile average pricing of the ads in the C2C trade. This northern area is also an area of interest when it comes to the clustering of the userspop variable in figure 23, with relatively high shares of users per population as well as low averages nearby. These characteristics could be related to the recent housing development of this area and the proximity of the new railway line (Kehärata in figure 26), connecting the airport among others with the

national railway network. Small significant clusters of lower users per population can also be seen in Espoo and eastern Helsinki in figure 23.

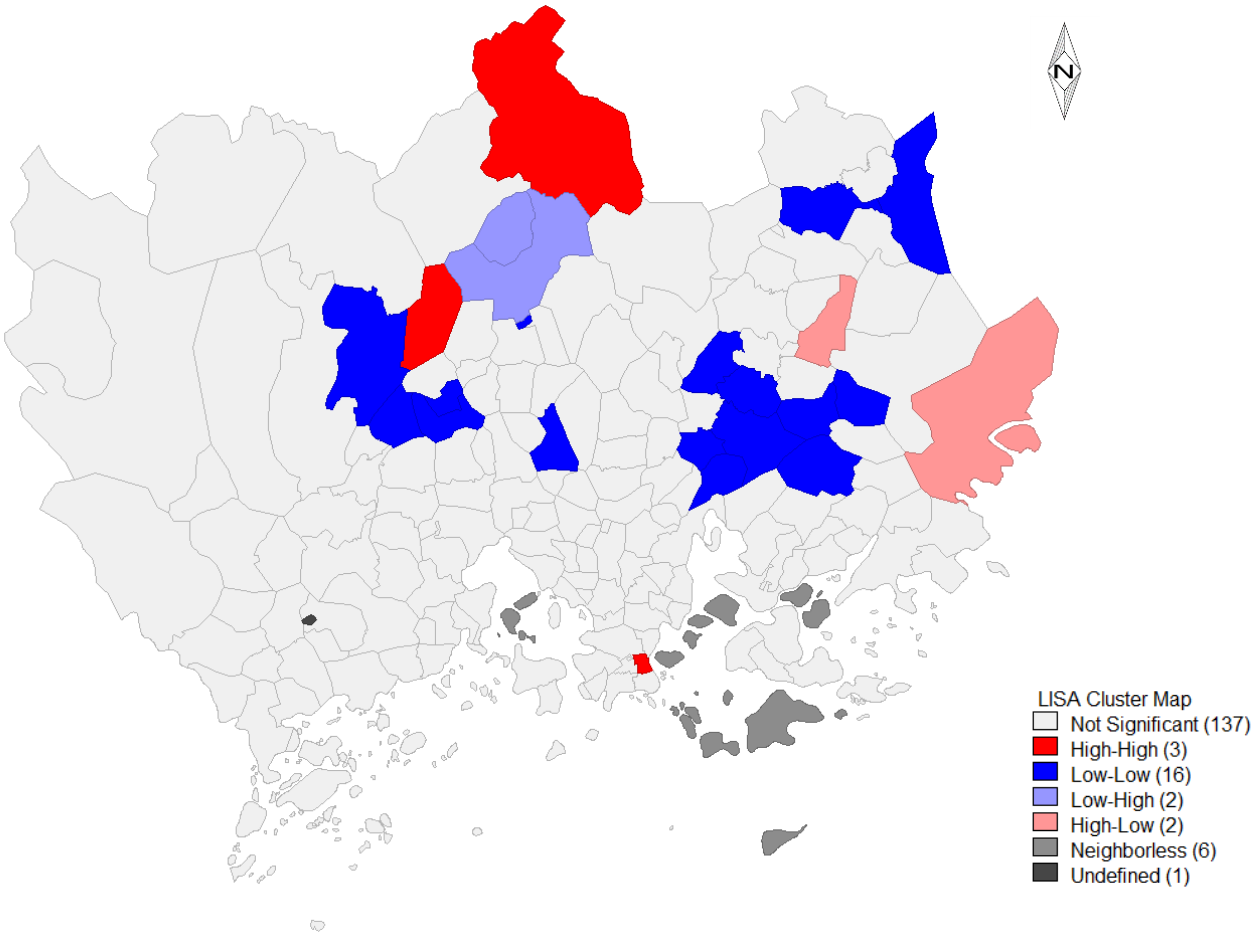

Figure 22. LISA cluster map of price per ad (mp_gd_pric variable). Some low value-clustering to be seen in the suburbs in the central-eastern suburbs, while high clustering can be seen in the north.

The next figures 24 and 25 show the activity in the C2C trade based on gender. When looking at the male activity in figure 25, the same cluster in the north-east can be identified as in figure 21. A west-eastern divide can also be seen when looking at the clusters in figure 25. In figure 25 the inner-city – suburban divide, as discussed previously, does not seem to be based on the males using Tori.fi. However, when looking at figure 24 of the activity in the trade of females, this divide is visible. From this a conclusion could be drawn that females are less active using Tori.fi in the inner-city compared to the suburbs, while it for males does not seem to be as much related to the closeness of the inner-city. The reasons for this might be related to the use of other C2C trading services or preferences among females in the inner-city.

The conclusions from the spatial analysis in this study are that there is no mentionable global spatial autocorrelation in the C2C e-commerce in the capital region of Helsinki. On the contrary, there are many local clusters when it comes to the activity, pricing and users, showing a similar inner-city – suburban divide as identified in the Tori.fi users section (4.2.). There are also exceptions to this, for example when it comes to the activity of males in the service. The reasons for the clustering in the research area might be related to many phenomena, such as areal development or accessibility, not to mention all the socioeconomic and regional differences which cannot be exclusively explained with these spatial quantitative methods. This will be discussed and speculated upon more thoroughly in the discussion section (5. Discussion).

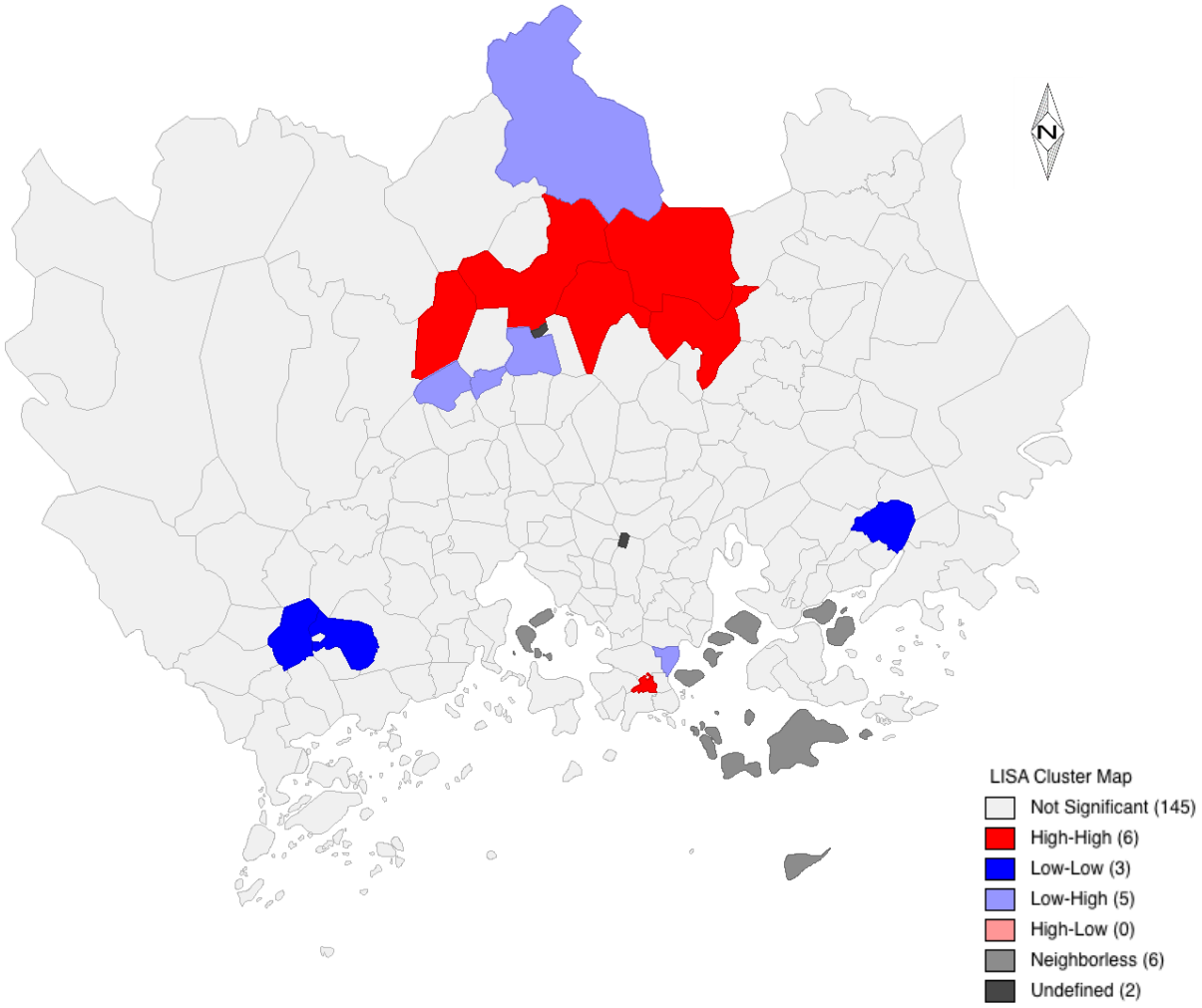

Figure 23. LISA cluster map of users per population (userspop). Clear clustering can be found in the northern region of the research area.

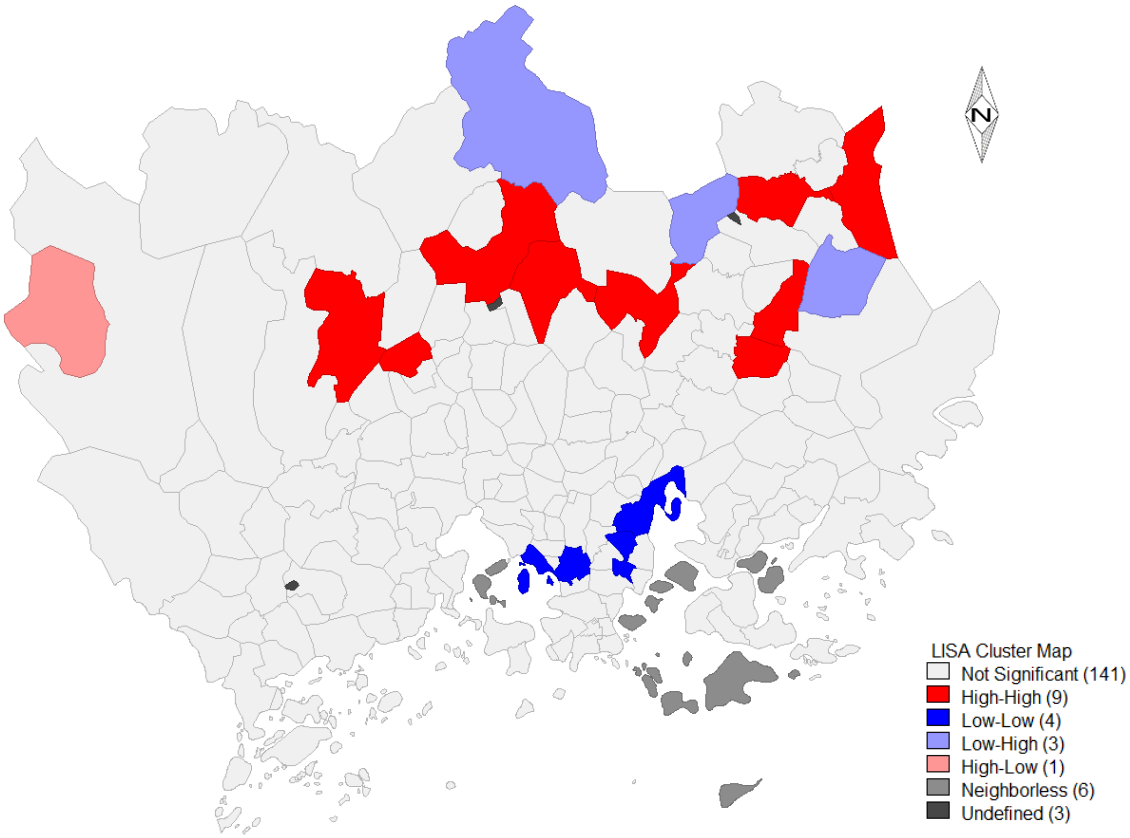

Figure 24. LISA cluster map of ads per female account (ads_fem). Interesting high female-activity clustering in the periphery areas of the research area.

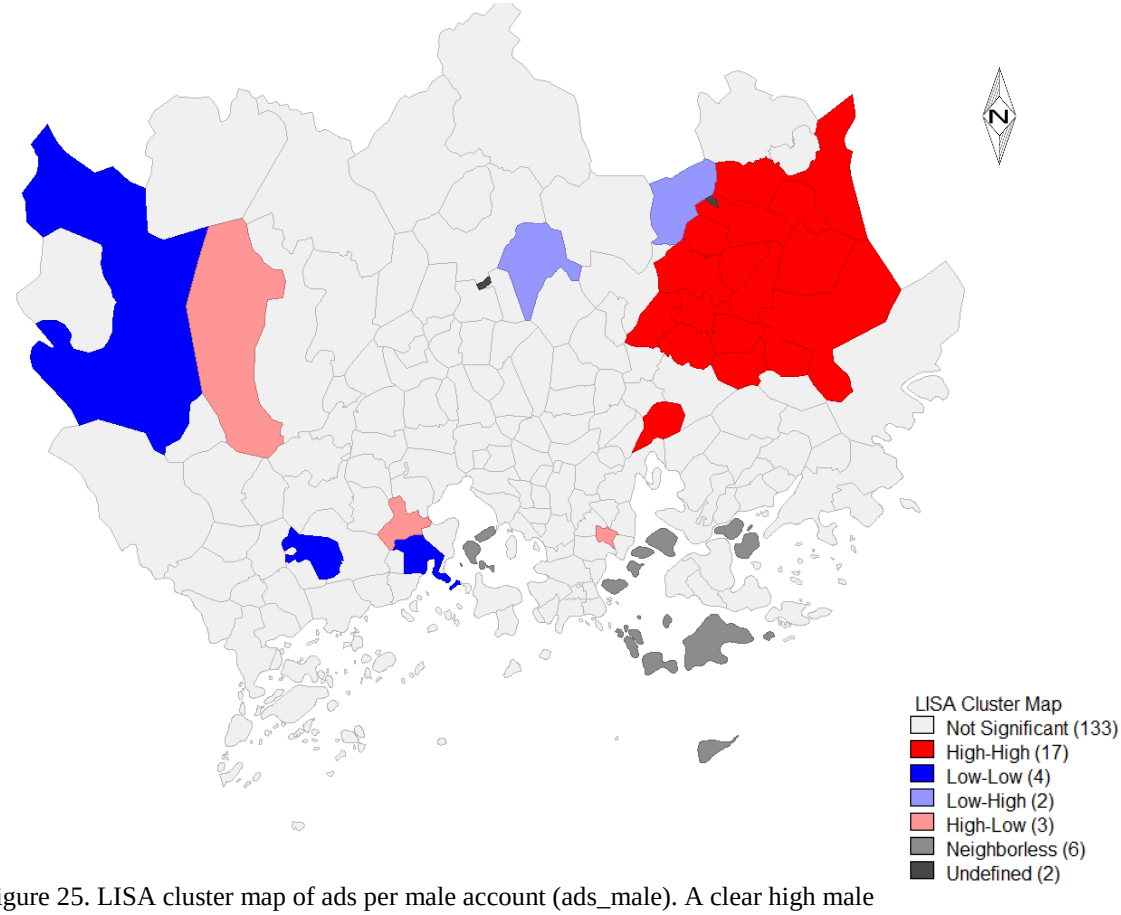

Figure 25. LISA cluster map of ads per male account (ads_male). A clear high male activity cluster in the north-eastern parts with a few low value clusters scattered in the research area.

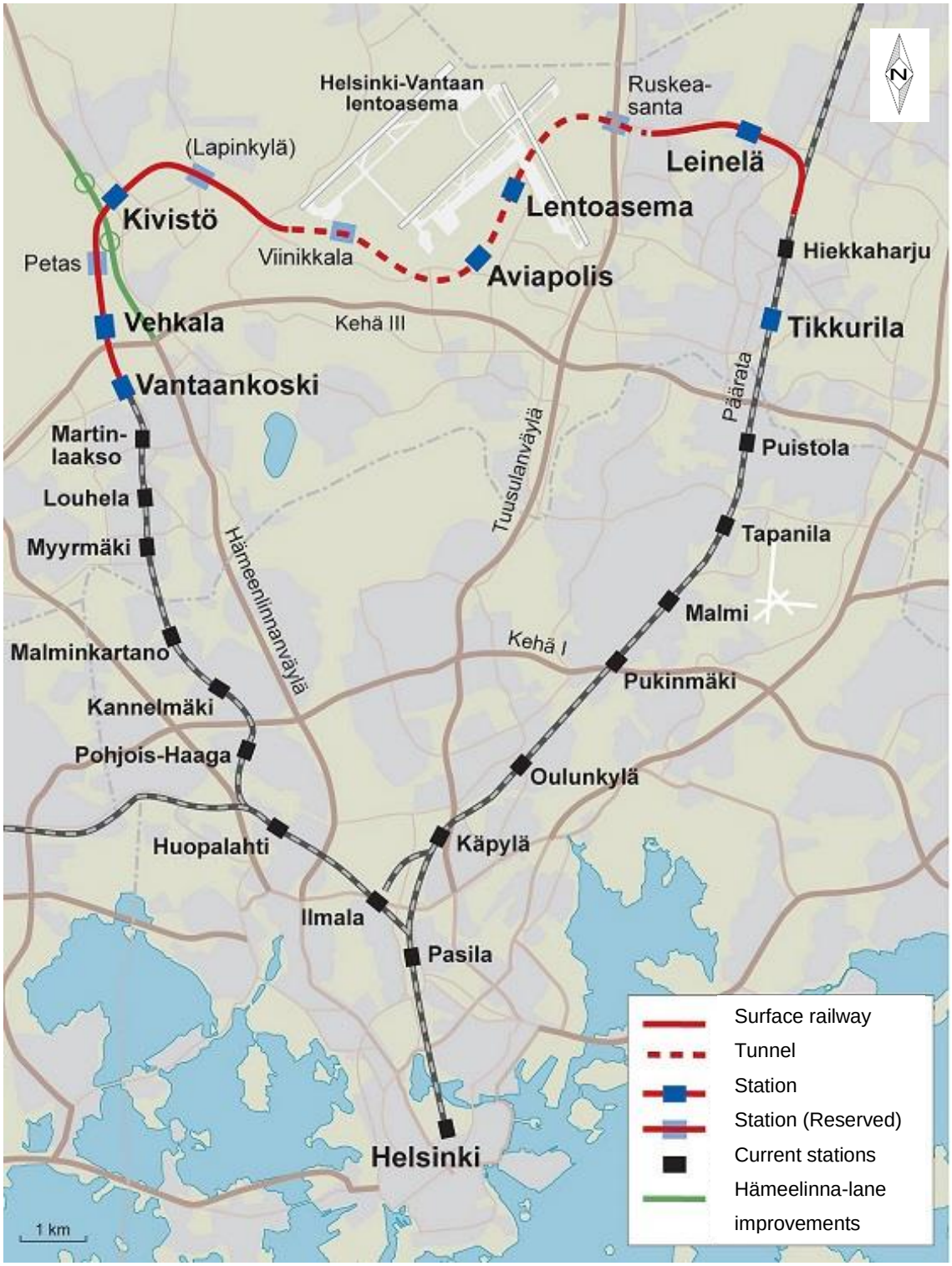

Figure 26. The route of the Kehärata railway line finished in late 2015 (Liikennevirasto, 2016). This new railway is in the north of the research area and connects the railway to the Helsinki-Vantaa international airport.

4.4. Significant correlations in the C2C e-commerce

The aim for the correlation analysis in this study is to identify linear associations with the background variables and the Tori.fi-dataset of attributes (see table 1) in the C2C e-commerce. The significant correlations of interest will be displayed and analysed to determine what kind of connections there are with the background, life-phase and households with the C2C trade in the research area. The highest positive and negative correlations will be validated, and the associations of variables will be evaluated to determine whether casual relations can be assumed or confirmed. The scatterplots in figure 27 to 29 show closer how certain selected variables are placed on a linear scale, to further improve the understanding of the correlations of these variables in question. A more detailed explanation of the methodology behind the correlations analysis results can be seen in the methods section (3.6.2.).

From table 2 the significant correlations are visible for the adsuser variable matched to the Paavo-data variables (see appendix 3 for variable explanations). The highest positive correlations are with the shares of certain younger age groups, with the share of children in the age of 0-14 being the highest at a value of 0.360. Consequently, also the shares of households with these age groups are represented with higher correlations ranging from 0.313 to 0.278, which confirms that families with children is a driver for high values of classified ads per user. The highest positive correlation, related to the educational background of the population, is the ko_ammat (Vocational diploma) with 0.279. Nevertheless, there are also a few negative correlations values related to education. These are ko_yl_kork (-0.356), ko_yliop (-0.327), and ko_al_kork (-0.253). From these numbers, we can draw the conclusion that the activity of the users in the C2C e-commerce, to a certain extent, is associated with the education level. This might also be related to the overall demographics of these postal codes in question. Other positively correlated variables are the average size of households and the average size of the housing, which is likely connected to the characteristics of the areas with higher shares of families, rather than a direct connection with the activity in the C2C trade. Whether the family or apartment size influences the activity in the trade can be speculated, with reasons such as a higher consumption of goods partly related to activity in the service.

Table 2. Significant correlations with the adsuser variable.

Adsuser Variable	Pearson Correlation	Significance **≤ 0.01, * ≤ 0.05
pt_0_14	0.360	**
he_18_19	0.348	**
he_13_15	0.345	**
he_16_17	0.339	**
te_laps	0.313	**
te_aklap	0.306	**
te_teini	0.298	**
te_plap	0.291	**
ko_ammat	0.279	**
te_klap	0.278	**
he_3_6	0.278	**
te_takk	0.269	**
he_0_2	0.234	**
ra_as_kpa	0.231	**
ra_pt_as	0.226	**
tr_ke_tul	0.209	**
he_45_49	0.203	**
te_omis_as	0.184	*
mp_gd_pric	-0.475	**
ko_yl_kork	-0.356	**
ko_yliop	-0.327	**
te_nuor	-0.309	**
he_85	-0.265	**
hr_pi_tul	-0.261	**
he_25_29	-0.257	**
ko_al_kork	-0.253	**
ra_kt_as	-0.226	**
hr_ovy	-0.217	**
pt_tyoll	-0.193	*
he_kika	-0.182	*
he_20_24	-0.182	*

The highest negative correlations with the ads per users, as seen in the table 2, when excluding the variables related to education are the mp_gd_pric (-0.475), te_nuor (-0.309), he_85 (-0.265), hr_pi_tul (-0.261), he_25_29 (-0.257). The mp_gd_pric variable's high negative correlation shows that the higher average price of ads in the postal code region, the less ads are published and vice versa. Although this is expected, it might also be related to the population structure of certain areas. This might also be related to the dominance of children's clothing and merchandise that is typically traded more frequently in some regions. The negative correlations of the share of young single persons variable (te_nuor) as well as the age group of 25–29-year-olds (he_25_29), also

verifies this hypothesis of the children's role in a higher activity in the C2C e-commerce in the study area (the average age of mothers having their first-born child is 29.1 years (Statistics Finland, 2017b). The negative correlation of the share of inhabitants to the lowest income category (hr_pi_tul) might be related to less opportunities (for example having less property) in participating in the trade. The same applies to the share of persons above 85 (he_85), however this is also related to the lower share of internet use among elders (only 27% of the population aged 75-89 are internet users in Finland (Statistics Finland, 2013)), which naturally could exclude this group from the electronic commerce.

The significant correlations with the mp_gd_pric variable, showing the average price per sold ad in each postal code, can be seen in table 3. Notable is that less variables are significantly correlated with mp_gd_pric, which means that there are less linear associations determining the average price. A few interesting correlations arise from this analysis, for example the positive correlation of men and the average price of the ads (he_miehet, 0.241). The reason for this is ambiguous, however it might be related to the trading habits of the household, with women displaying different trading habits (Hernández, Jiménez, & José Martín, 2011), perhaps with lower average prices. This might also be related to the gendered income gap in Finland (Statistics Finland, 2011) that could affect the pricing mechanisms of the ads.

Table 3. Significant correlations with the mp_gd_pric variable.

Mp_gd_pric Variable	**Pearson Correlation**	**Significance ** ≤ 0.01, * ≤ 0.05**
he_miehet	0.241	**
he_50_54	0.222	**
hr_pi_tul	0.196	*
ko_yl_kork	0.195	*
te_as_valj	0.187	*
he_40_44	0.186	*
hr_ktu	0.175	*
tr_ktu	0.162	*
adsuser	-0.475	**
he_0_2	-0.280	**
he_naiset	-0.241	**
te_plap	-0.234	**
pt_0_14	-0.198	*
tr_ke_tul	-0.192	*
te_aklap	-0.160	*

Another variable of interest is the persons belonging to the lowest income group (hr_pi_tul, 0.196), that is positively correlated with the average pricing of the sold ads. A single reason for this is not possible to determine from the results, but notable is that these groups insert less ads on average (see adsuser correlations above in table 2) and participate less in the trade overall (with negative correlation with userspop in table 3). The income of inhabitants seems to be correlated with the average price of ads as well with hr_ktu (0.175) and tr_ktu (0.162). However, these positive correlations are minor. The age also affects the average price as seen in the table 3, with the share of older age groups being positively correlated, while the children are negatively correlated. This also shows the role of life-phase as an indicator for behaviour in the C2C e-commerce, in this case the pricing. The negatively correlated variables with mp_gd_pric are, to name a few, adsuser (-0.475), he_0_2 (-0.280), he_naiset (-0.241) and te_plap (-0.234). This shows that the share of children and households with children tend to indicate a lower average price per sold ads. The share of the households belonging to the middle-income category (tr_ke_tul) is also negatively correlated with mp_gd_pric (-0.192), which is worth a mention.

Looking at the userspop variable in the Tori.fi-dataset (description in table 1), that measures the participation in the C2C e-commerce trade; there are similar patterns that the other correlations already have revealed. Yet, there are fewer similarities in the userspop variable correlations (table 4) compared to the earlier discussed variables (adsuser and mp_gd_pric). For example, the significant positively correlated variables that stand out are the he_30_34 (0.453), te_eil_np (0.419) and similar that indicate a high participation in the trade among the young. This is related to the higher users per population rates in the inner-city (as seen in figure 18), which also happens to have a younger demographic structure. This might also be explained by the ease of local trade in the densely-populated areas. When looking at the ko_al_kork variable (0.365), one could suggest that the education level affects the participation in the C2C trade. The highest correlation with the users per population, in the research area, is the share of workforce (pt_tyoll, 0.600), while related high negative correlations are pt_tyovu (-0.577), te_elak (-0.418) and pt_elakel (-0.363). This shows that there are

demographics that are not participating in the C2C e-commerce, especially in areas where the older and retired age groups and households reside. This can also be seen in the rest of the negative correlated variables in the table 4. Therefore, when looking at the participation in the C2C e-commerce, the socioeconomic status and demographics do seem to have an impact when looking at this metric. Yet, as mentioned earlier, there are stronger indications, in the activity in the trade and the average prices of the ads, that the socioeconomic background of the inhabitants is related to the C2C e-commerce in the capital region of Helsinki.

Table 4. Significant correlations with the userspop variable.

Userspop Variable	**Pearson Correlation**	**Significance ** ≤ 0.01, * ≤ 0.05**
pt_tyoll	0.600	**
pt_tyovy	0.577	**
he_30_34	0.453	**
te_eil_np	0.419	**
he_35_39	0.400	**
ko_al_kork	0.365	**
tp_tyopy	0.340	**
he_25_29	0.334	**
te_nuor	0.311	**
te_aik	0.292	**
tp_k_raho	0.284	**
tp_g_kaup	0.226	**
he_0_2	0.201	*
pt_tyovu	-0.577	**
te_elak	-0.418	**
pt_elakel	-0.363	**
he_70_74	-0.345	**
tp_q_terv	-0.344	**
he_80_84	-0.330	**
he_kika	-0.314	**
he_55_59	-0.307	**
he_75_79	-0.294	**
he_60_64	-0.285	**
he_50_54	-0.280	**
tp_p_koul	-0.277	**
he_65_69	-0.265	**
he_18_19	-0.261	**
he_85	-0.258	**
ko_perus	-0.248	**
he_16_17	-0.193	*
mp_gd_pric	-0.193	*
tp_n_hall	-0.183	*
hr_pi_tul	-0.180	*
pt_vakiy	-0.176	*
pt_muut	-0.174	*

pt_opisk	-0.173	*
he_13_15	-0.170	*
he_vakiy	-0.164	*

In the scatterplots below (figures 27-29), some of these correlations for all the three Tori.fi-dataset variables (adsuser, mp_gd_pric and userspop) are shown. In figure 27, we can see that the linear association is not that clear in any of the correlations except for the mp_gd_pric variable that fits the negative trend line the best. This does not only point out that the mp_gd_pric variable has the highest negative correlation, but also that it is noticeably linear, meaning that the higher ads per users means lower average per sold merchandise. The other variables in figure 27 do not show as clear a pattern, but they are scattered in a way that is meaningful. In figure 28, which shows the relevant variables that correlate with mp_gd_pric, the male (he_miehet) and female (he_naiset) variables correlation scatterplots have little differences, with all values grouped quite closely. This is, of course, related to the population structure in the research area, where there are quite even shares of men and women. The age group variable (he_50_54) displays a similar pattern, with some more variation in the grouping of the values, while the adsuser, te_plap and he_0_2 show a clearer linear pattern. From this we can determine that the gender does not have as distinct an association with the average price of the sold ads, whereas the correlation with the variables that relate to the share of children is better. The variables of figure 29 are all scattered in a rather linear pattern, which validates the userspop correlation results discussed above.

These correlation analysis results demonstrate that the socioeconomic and demographic background of the users affect the use and participation in C2C e-commerce in the capital region of Helsinki. The biggest factors for this being educational level, income, age and stage in life as well as family size. Interestingly, these factors affect the participation in the trade to a lesser extent. The correlation analysis results also show the earlier discussed inner-city – suburban divide, which can be seen from variables that are characteristic to the suburbs, such as te_takk (average size of households), correlating positively with the adsuser variable. The same can be said about the Paavo statistic variables that correlate with userspop, but with variables typical for the inner-

city, in this case, correlating positively. Generally, the userspop correlations display different correlations than the adsuser and mp_gd_pric variables, although with common elements. It is also important to note that many variables related to the socioeconomic status and demographics do not correlate significantly with these Tori.fi-dataset measures. This does not, however, mean that they are not necessarily relevant for this study, and for that reason I will address this problem in the following section with the regression analysis that explores Paavo-variables that explain the use, pricing and participation in the C2C e-commerce.

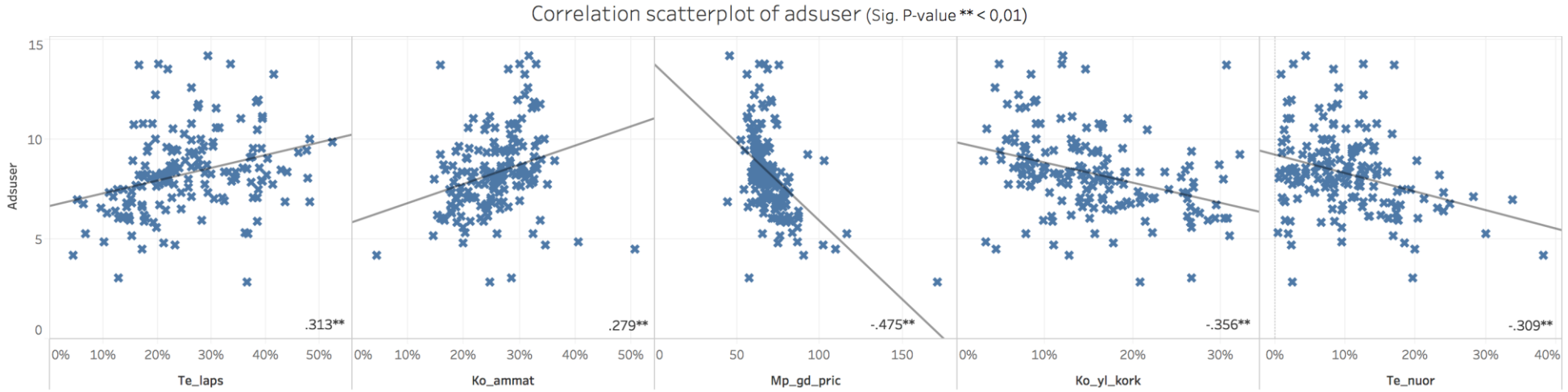

Figure 27. Correlation scatterplot with selected variables for the adsuser variable. The mp_gd_pric has the clearest linear pattern with the adsuser variable.

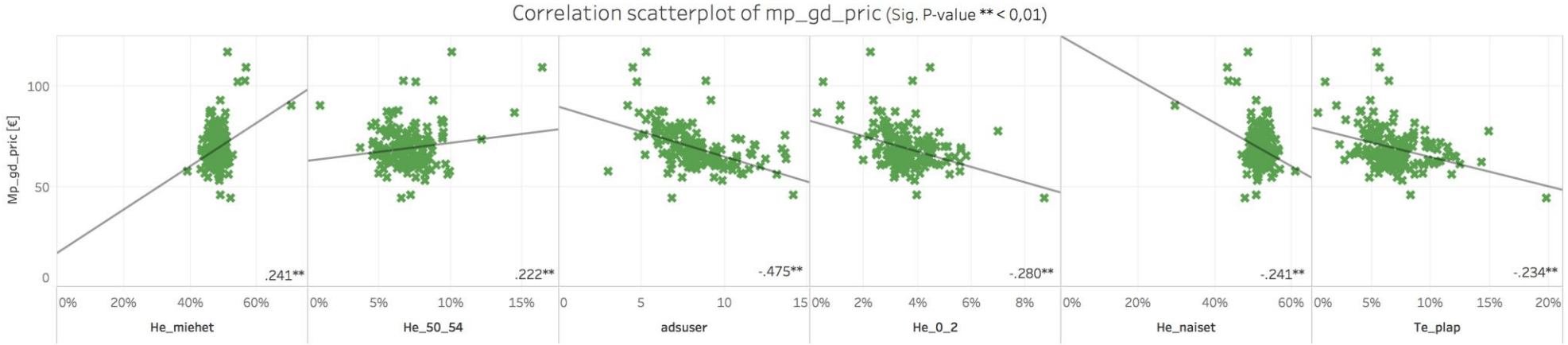

Figure 28. Correlation scatterplot with selected variables for the mp_gd_pric variable. The scatterplots in this figure are heavily concentrated, except for the adsuser variable.

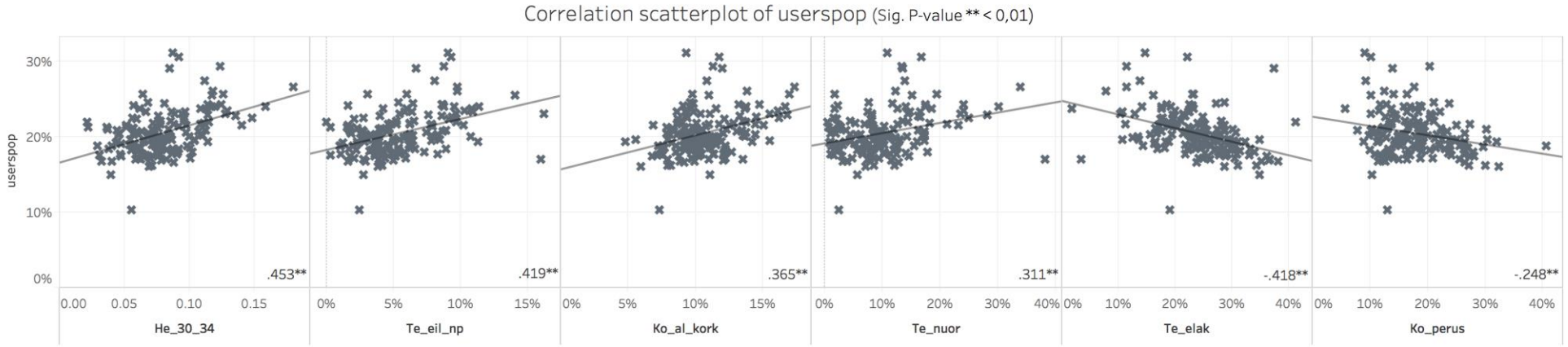

Figure 29. Correlation scatterplot with selected variables for the userspop variable. Some clear linear patterns can be seen in this figure, namely for the he_30_34 and te_eil_np variables.

4.5. Linear regression analysis and modelling of the C2C e-commerce

In this study, I have used regression models to determine which variables have the biggest effect on the activity, price per ad and users per population in the C2C e-commerce service of Tori.fi in the capital region of Helsinki. In the methods section (3.6.2) the exact details can be seen about how this analysis was conducted and what statistical test and validations have been made. The regression models in this case are all linear, thus they describe the goodness of fit on a linear regression line. This is measured with an R-square value ranging from 0 to 1, with 100% (value = 1) implying that the dependant values are fully explained by the predictors (independent values) and 0% (value = 0) indicating no linear relationship between the variables. The benefit of using this type of analysis is that it does not take a stand on whether their impact is positive or negative, only which ones explain the dependent variable the best together. For this reason, the regression analysis complements well the other methods used in this study to define the socioeconomic and demographic dynamics of the C2C e-commerce. In the following part I will describe the models, the reasoning behind selecting the variables as well as show regression plots for each model.

The first model (figure 30) has the adsuser variable from the Tori.fi-dataset (explained in table 1) as a dependent value. The independent values are the following: te_eil_np, mp_gd_pric, ko_yl_kork, hr_pi_tul, he_18_19. These have been chosen based on how well they describe the dependant value and based on the fact that they are not related or correlated amongst each other. The model displays an R-square value of 44%, meaning that almost half of the ads per users are explained by these independent variables. In the correlation and spatial analysis, the high impact of the ad pricing on the average numbers of ads per user was discussed, and therefore it is not surprising that this variable is also present in the model. With the correlation statistics in mind for adsuser, the he_18_19 (age group of 18-19), hr_pi_tul (lowest income group) and ko_yl_kork (higher education) also have an expected occurrence in this regression model. However, the te_eil_np variable (young couples without children) is unexpected based on the correlation analysis. Yet again, it is quite natural for this variable to be in the model, when bearing in mind how the share of children and family households affects the user activity positively. Generalised, this model validates the earlier findings in this study

that the education level, pricing of ads, income and life-phase are the factors for activity in the C2C e-commerce. From the regression plot in figure 31, the model is visualised on a linear regression line. We can see that the prediction is quite accurate when looking at ads per users around the average value, but with the higher values it is less accurate. Overall, there are no alarming outliers in this model and the results are valid.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.664[a]	.441	.423	1.56052268	1.648

a. Predictors: (Constant), te_eil_np, mp_gd_pric, ko_yl_kork, hr_pi_tul, he_18_19

b. Dependent Variable: adsuser

Figure 30. Regression model 1 for adsuser. $R^2 = 0.441$ (Enter method).

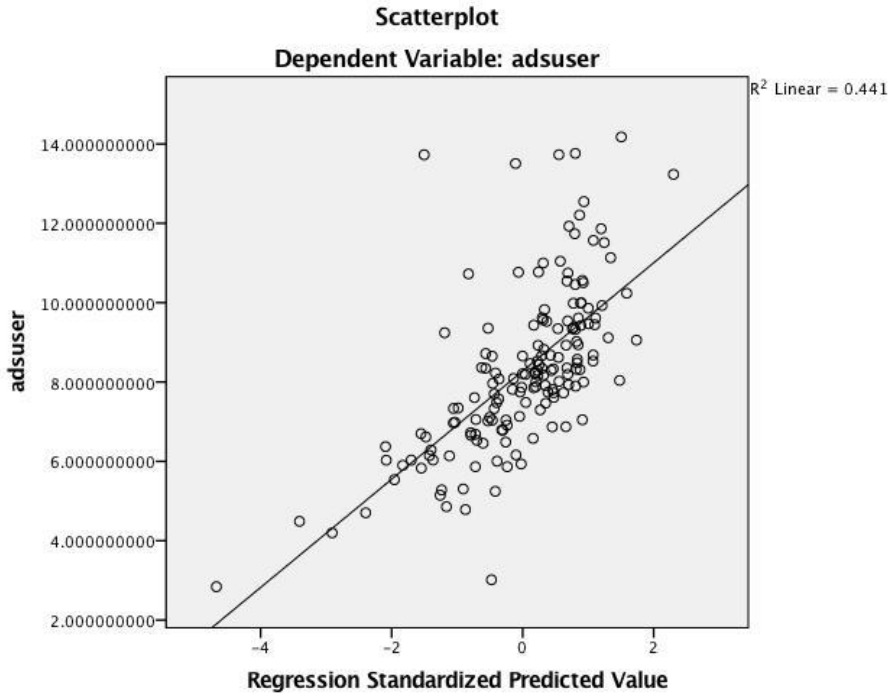

Figure 31. Regression scatterplot for the model 1. The model explains 44% of the ads per user.

The following regression model can be seen in figure 32. This model has mp_gd_pric as a dependent variable, with the aim to explain what determines the average price of the sold ads per region in the study area. The independent values are he_40_44 (age group 40-44), adsuser (ads per user), he_35_39 (age group of 35-39), tr_ke_tul

(households belonging to the average income group), he_miehet (men), te_klap (households with school-aged children) and ko_perus (basic level studies). These variables explain together 56% of the average price of ads in each postal code. From these results, we can see that the share of children as well as the ads per users are again included independent variables in this model. The age group-variables from 35-44 and men are also visible in the earlier conducted correlation analysis, which makes them expected in this model. These age group and gender variables are also observable in the other analysis done in this study, and therefore they confirm the findings discussed in previous sections. The variables that are unexpected, when looking at the correlations, but also influence the model, are the households belonging to the average income group and the persons with basic level of studies. These two variables give new insight that they are also a part of the dynamics that determine the average price of ads in the C2C trade. The scatterplot in figure 33 shows that the predicted values of the regression model is gathered around the average mp_gd_pric-value. In this case, they are also gathered even more than in the first model (figure 31), which could suggest that the model is more accurate, which also the R-squared value implies. Interestingly, there are also some higher values that fit the regression line well and contribute to the higher R-square value. It is also important to notice that this model has more variables predicting the dependant value (7 independent values (figure 32)) than the adsuser model (figure 30 with 5 independent values). This means that the model (figure 32) should better explain the dependent value mp_gd_pric, but the individual variables have presumably less impact.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.750[a]	.563	.543	7.01956042	1.610

a. Predictors: (Constant), he_40_44, adsuser, he_35_39, tr_ke_tul, he_miehet, te_klap, ko_perus

b. Dependent Variable: mp_gd_pric

Figure 32. Regression model 2 for the mp_gd_pric variable. $R^2 = 0.563$ (Enter method).

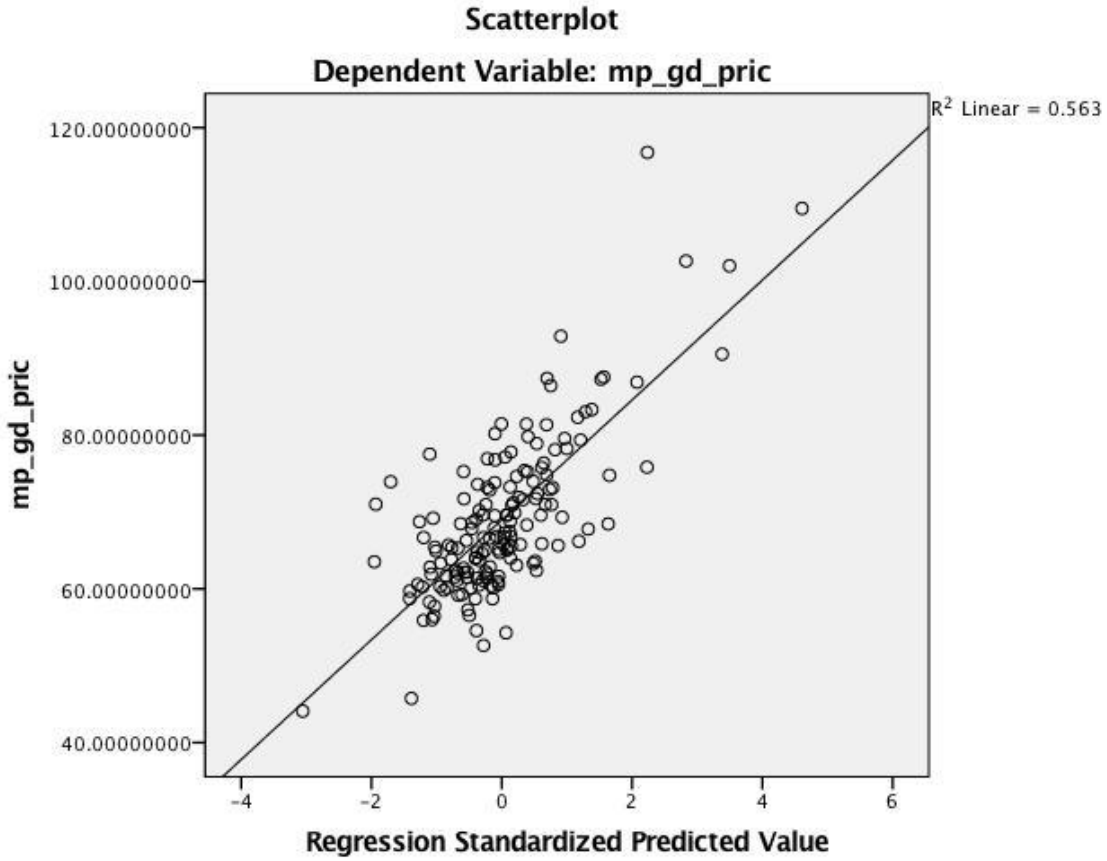

Figure 33. Regression scatterplot for the model 2. The model explains 56% of the pricing of the ads.

The last model in the regression analysis is the userspop model (figure 34). For this figure, the userspop variable is the dependent value and the following variables are independent: pt_opisk (students), ko_yl_kork (higher education), he_25-29 (age group 25-29), he_70_74 (age group 70-74) and tr_hy_tul (households belonging to the highest income group). The R-square value for this model is 62%, which is the highest of the regression models. In the scatterplot (figure 35) the predicted values are linearly spread with small variances and no significant outliers present, which validates the regression model. From these results, we can see that the participation in the C2C e-commerce is dictated largely by age groups; older age groups being presumable less prone to use the trade while younger being more likely to participate. The results in the model might also be related to the regional distribution of the users per population (figure 18 and 23), that in this case emphasises certain, typically inner-city characteristics, as being predictors for the participation in the commerce. This might also be the reason for the higher education and students as well as the highest income group being present in the model. Because of the inner-city (variable) traits being so dominant in this model, it is

hard to say whether further conclusions can be drawn from this model when discussing actual backgrounds and motives to participating in C2C e-commerce.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin–Watson
1	.785[a]	.616	.604	.01867	1.952

a. Predictors: (Constant), pt_opisk, ko_yl_kork, he_25_29, he_70_74, tr_hy_tul

b. Dependent Variable: userspop

Figure 34. Regression model 3 for the userspop variable. $R^2 = 0.616$ (Enter method).

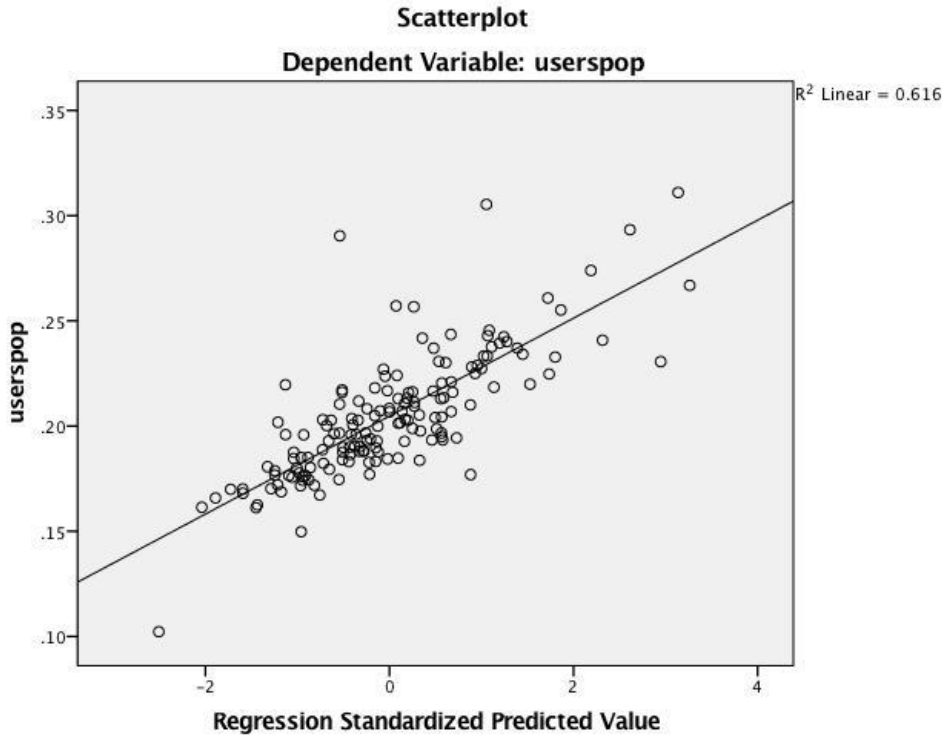

Figure 35. Regression scatterplot for the model 3. The model explains 62% of the users per population.

These three regression models have confirmed and completed many of the results discussed earlier, but also brought new details for the study. The inner-city – suburban divide can be seen in these models as well, with certain variables common for the city and the suburb clearly visible in the models. These regression models have also confirmed the role of children and families as an impactful cause for the use, participation as well as pricing the C2C trade. The impact of variables that have not

been significant in the correlation analysis, such as young adults without children and income groups, has also brought more details to the study with the help of these models. The thoughts these regression results have raised will be discussed and evaluated in the following section (5. Discussion and conclusions) along with the spatial and correlation results.

5. Discussion and conclusions

5.1. Regional structures in the research area

When looking at the backgrounds of the study, as well as the results from the analysis, there are clear indications that both my research questions can be answered positively. My results show that there are regional patterns when looking at the online e-commerce in the capital region of Helsinki, both when examining the use, participation as well as the activity in the trade. Similarly, there are associations with the backgrounds of the users of the C2C e-commerce, and the general demographics and features of the capital region. One aspect that is related to this is the regional structures of the C2C trade that also seem, to a certain extent, to follow similar patterns is the regional differentiation development (see 2.5.2. The social and regional differentiation in the capital region of Helsinki (Vaattovaara, 1998, 1999; Vilkama, 2011; Vilkama et al., 2014)). Since this trend also is related to the socioeconomic status of the inhabitants, conclusions can be drawn that the consumer-to-consumer trend is related both to regional structures and backgrounds of its users. Demographic factors also seem to affect the use of C2C e-commerce, which is related to the general discussion about technology use and skills (see for example 2.2.3. Demographics and socioeconomics of the internet and Fuchs, 2009; Helsper & Reisdorf, 2016; Ono & Zavodny, 2007). The hypotheses made for this study further elaborate on these connections, as well as on what conclusions can be drawn from the results of this and earlier studies. Consequently, these will be discussed in the following sections.

5.2. Demographics and internet access affect the use of C2C e-commerce

My research showed that from a regional perspective, when looking at the gendered share of the accounts (figure 19), men are more prone to have an account in this C2C e-commerce service. Interestingly, men also seem to be selling more expensive merchandise when looking at the average price per ad (mp_gd_pric). Lindholm & Mustonen (2016) share partly contradicting results, showing more activity among females in the consumer-to-consumer trade, which could translate into activity in C2C electronic commerce. On the other hand, when looking at the participation (userspop) and the activity (adsuser) the gender variables are not significantly correlated with these factors. This could imply that although there are more male accounts in the service, the actual activity and participation does not differ by gender. Therefore, it is impossible to say from these results whether the general more active C2C trading is transformed into actual use C2C e-commerce in Tori.fi. One must also remember that in this study, only the C2C e-commerce in Tori.fi has been looked at, which could mean that women overall are more prone to be active on other, multiple or offline platforms. The possibilities of users without accounts and shared accounts also complicate the gendered relations, as well as the actual demographics of the capital region (as seen in Statistics Finland, 2017a).

Other demographics also have a role in the use of technology and, consequently, older age and lower education is reported to have an impact on the use of online technology (Porter & Donthu, 2006). This can be seen in the activity and participation of the users, presented in this study, which shows that almost all elderly groups are less active in the C2C e-commerce. When looking at the participation in the C2C e-commerce, it seems to be higher among young adults, which could be related to the digital native debate (2.2.4. The digital natives) and perhaps the proneness of younger demographics using online technology for shopping (Joines et al., 2003). In addition, in the trust of the C2C e-commerce, age also seems have an effect. Yoon & Occeña's (2015) study shows that third party recognition is the most important for the younger age groups from 20- to 30-year-olds, while the trust of the buyer or seller is more significant for the older age groups above 40. This cannot be directly seen in the results of this study, although the regional participation of younger adults, as a share of the population, is greater than for the middle-aged groups in Tori.fi, even though the middle-aged groups seem to be more

active. This could indicate that the mentioned trust aspect modifies the user-behaviour, however, it remains uncertain.

Yet, when it comes to education, it seems to be more complicated in the Finnish context, with contradicting results in this study. My findings are that higher education seems to lower the activity in the C2C e-commerce, which means that larger shares of population with vocational studies, in a postal code area, indicate more activity and the opposite. However, this could be a result of the inner-city – suburban divide, rather than directly caused by the education level. In participation and the average price of sold ads, again, there is an association with higher education. The fact that higher activity significantly reduces the average price of the ads in the postal code regions might as well have a part in these results. The higher participation among the higher educated in the consumer-to-consumer electronic commerce, shown by this study, is also mentioned in the literature (Lindblom & Mustonen, 2016), which validates these findings. However, whether it is the regional characteristics of the inner-city, the positive attitudes among the highly educated and inner-city residents (Lindblom & Mustonen, 2016), or skills and opportunities held by advantageous socioeconomic groups (Helsper & Reisdorf, 2016; Ono & Zavodny, 2007) that causes this, can be speculated upon. With the regression analysis presented in this study, it can also be said that demographic and socioeconomic factors do contribute to the activity and participation in the C2C e-commerce as well as the pricing of classified ads. Concludingly, these above-mentioned aspects mean that the first hypothesis (H1), can be accepted, while the fourth hypothesis (H4) must be reconsidered.

5.3. The regional differentiation can be seen in the C2C e-commerce in the capital region

Another important topic of this study was the social and regional differentiation in the capital region of Helsinki. In this study, life-phase was considered one of the main reasons for activity in the C2C e-commerce, with the share of children represented in both the correlation and regression analysis. With social differentiation in mind, life-phase was also considered an impactful factor, dividing the research area, where

especially suburban middle-class families have the greatest influence (Vaattovaara, 1998). This suburban clustering can also be seen in the cartographic analysis as well as the LISA analysis, and might be associated with the general polarising development of the city (Musterd et al., 2017; Sassen, 2001; Vaattovaara, 1998). These results are in line with my hypothesis (H2).

Lindblom & Mustonen (2016) discuss, as mentioned, how higher education seems to have a positive impact on participation and attitudes towards the C2C trade. In this study, this can be seen, with regional differentiation in mind, in the behaviour in the western parts of the region. For example in the proximity of the shoreline in Espoo that is identified as an area with higher socioeconomic status and concentrated economic advantages (Vaattovaara, 1998). However, on the contrary, when looking at activity and participation in the C2C e-commerce in the results of this study, clear backgrounds factors that cause social differentiation cannot be identified. Exceptions to this are the share of inhabitants outside of the workforce (pt_tyovu) and the share with basic level education (ko_perus) that are negatively correlated with participation in C2C e-commerce. The reason that other factors are not present in this research, might be related to the discussions of Vaattovaara (1998, 1999) that identify segregated areas to be scattered to smaller concentrated units. Consequently, this cannot be identified in the results because of the postal code level of detail in this analysis. Interesting is also that there are such large differences in the social variables in participation (measured by userspop) and activity (measured by adsuser) in the e-commerce in the research area. The regional differentiation debate also shows clear signs of an inner-city – suburban divide, which my results also indicate. This confirms to a certain extent the hypothesis set (H2), but it must be noted that the dynamics of C2C e-commerce trade is impacted by many other factors than only the regional differentiation, as suggested in this study. However, as argued, solid similarities can be seen.

5.4. Clear signs of an inner-city – suburban divide in the C2C e-commerce

The connections with regional differentiation and the C2C e-commerce, as mentioned, is one of the main findings in this research. For example, the reasons for the divide of

the inner-city and the suburb, is contributed by different use and participation in the C2C trade. Interestingly, in the pricing dynamics of the C2C e-commerce, this divide is not as significant. However, this divide can also be explained by other factors. The results of this study show that the activity is higher in the suburban areas, as seen both from visual analysis, clustering analysis as well as the sociodemographic features that positively correlate with the adsuser variable. These are mostly variables related to the type of housing, the household size and stage of life that shows typical characteristics of the suburb, but also typical traits for the inner-city. For example, the household size is presumably bigger in the suburb, while the share of block flats is higher in the inner-city, which is reflected in the results. When looking at the differentiation in the capital region of Helsinki, the results also indicate differences between the inner-city and the suburb, which in this case could indicate an association between C2C e-commerce and regional differentiation.

Although the activity in the C2C e-commerce is higher in the suburb, and it is concentrated to the most socially differentiated areas in the east-north-east (Vaattovaara, 1998), it might not be those that are of the lowest socioeconomic status that contribute to the activity measures seen in these results. Rather, I would suggest, that it is the families that could be seen as influencing this C2C activity, which, still are a major cause of the differentiated structure of the city, according to Vaattovaara (1998). The C2C activity-results would suggest that the findings of Lindholm & Mustonen (2016), which also show that the inhabitants in the suburbs are more prone to use C2C as a form of trade, can be confirmed. Therefore, in the light of these supporting results, the hypothesis (H3) can be accepted.

When looking at the participation through the userspop variable, there is also a clear inner-city – suburban divide. However, as the activity of the users is higher in the suburbs, the participation seems to be lower in these areas. This might, yet again, be related to the fact that inhabitants with higher education have more positive attitudes towards the C2C trade (Lindblom & Mustonen, 2016), and these groups are more heavily concentrated to inner-city areas than the suburbs. Another interesting result, regarding the participation of the C2C e-commerce, is the shares of younger adults that

seem to positively affect the participation in the trade. This can also be seen in Mustonen & Lindholm's (2016) research that discusses the positive attitudes younger adults have towards the C2C trade. Yet again, it is not possible from these results to say how positive attitudes translate into activity or participation in the C2C e-commerce. In this case, we must rely on the visual, correlation and regression analysis and the conclusions that can be drawn from these. Finally, it can generally be said that the location in combination with the background of the user affects the C2C e-commerce in the capital region of Helsinki.

5.5. Limitations

One of the main limitations, caused by the fact that there is no more accurate data available, is the observation level of postal codes in the capital region of Helsinki. The problems related to this is discussed in the ecological fallacy chapter (2.6), however, one must remember that in the context of the research area it is a valid level of detail, as well as one of the smallest administrative levels available for examination. Optimal, on the other hand, for researching this topic, would be the smallest possible units, like exact household or point data. These smaller units would diminish problems such as ecological fallacy as well as identify, for example, even minor regional or social differences.

The approach in this study has been quantitative, which can be seen as a great strength when looking at the actual observed use of C2C e-commerce in the capital region of Helsinki. On the contrary, this also opposes challenges when looking at important factors as attitudes and trust in the C2C commerce that are highly subjective, and would require interviewing the users or inhabitants of the research area. This also exemplifies one of the limitations in the study, which is that these demographic and socioeconomic statistics in the Paavo-dataset (see table 1) are combined with exact data of use, pricing and participation. Consequently, we cannot be sure that the statistical features (Paavo-variables) of the postal code areas match the actual sociodemographic structures of the users. This has, therefore, been addressed by calculating the share of each variable in each of the postal code areas, which means that the percental differences in each postal

code are minimal. This means that for some variables to stand out, they must be significantly dissimilar. Also, the fact that the statistical analysis considers all the variables in all postal codes and highlights variables of importance makes the key findings of the study area valid.

In this study, I have looked at the C2C e-commerce in the service Tori.fi. Thus, this means that there is no data about other marketplaces or forms of C2C trade, which inevitably impacts the results. However, when looking at C2C e-commerce, Tori.fi is the biggest actor in the Finnish market (Tori.fi, 2016) that arguably represents a majority of the C2C e-commerce in the capital region of Helsinki. Therefore, we can confidently say that this study represents the C2C e-commerce well, but there is the possibility of certain demographics or socioeconomics preferring other forms of C2C trade or platforms, which might affect the results. Nevertheless, when looking at earlier studies made in the same context, we can agree that there are no or few discrepancies between my results and earlier studies made. This confirms the results and displays the credibility of my results. Overall it can be said that, although there are limitations to this study, these do not significantly affect the outcome of this research. In the following section, potential topics for further research will be discussed, with the restrictions and questions that have arisen from this study.

5.6. Further research potential

This study has laid the foundation for studying the C2C e-commerce and its socioeconomics in the capital region of Helsinki. The C2C e-commerce has become a popular form of trade (Jones & Leonard, 2008; Wang et al., 2002; Yoon & Occeña, 2015), yet few studies have focused on these details of e-commerce. This means, that few aspects of the C2C e-commerce have been looked at, especially in the context of Finland, not to mention from a regional point of view. This creates many opportunities for further research, and some of these alternatives will be presented in the following paragraphs.

Firstly, potential further research could be taking other platforms, such as Facebook marketplaces, into consideration in a similar manner as in this study, or comparing the demographics of use between different C2C platforms. Another interesting topic would be looking at whether people prefer online C2C to offline, and what differences could be found. In addition, survey and interview studies of the C2C e-commerce could provide new insights about the commerce and determining the motivations of using these services. In the same way, trust as a C2C e-commerce aspect, could be looked at; in what manner, it encourages or discourage the use of e-commerce as well as how the background of the users affects the perceived trust.

When reflecting upon my results, some potential research topics arise. These could potentially be, to mention a few, how the accessibility in the capital region of Helsinki impacts C2C trading, how the residential area and community affects the proneness to trade locally, as well as how the popularity of the C2C e-commerce and collaborative consumption (CC) change the dynamics of the local market. One interesting aspect identified in this study, is the railways' role, for example the Kehärata (figure 26), in the perceived ease of trade in the context of the capital region of Helsinki. This is highly related to the above-mentioned topic of accessibility, where there are a lot of potential understandings to be discovered. In this study, I have not taken into consideration different characteristics of specific categories, when looking at all categories or only at the marketplace vertical (see appendix 1). I would argue that the dynamics of certain categories are quite unique both spatially, spatiotemporally and depending on the backgrounds and socioeconomics presented in this study. This provides many possibilities to focus on some markets or specific segments of the users, such as on families with children, which have proven to be an influential group in these results. One of the other topics that are highly relevant in the current debate is for example the concept of collaborative consumption (Hamari et al., 2016, p. 2047), as briefly mentioned. CC is closely tied to the C2C commerce and one of the potential fields of study, where there are many aspects to look at. This would, for example, be the backgrounds of using CC-services and how it differs from the C2C trade with the sharing side of the phenomenon considered.

Finally, it can be said that the C2C e-commerce is here to stay, and evolving concepts such as collaborative consumption, will together shape the way we trade and think in the future. The developing technology will provide new ways of communicating and consuming, which will potentially change the market and lessen the role of traditional commerce. However, in the near future, these forms of trades will be complementing each other, which inevitably will be beneficial for all the consumers, where the positive aspects of each trade are present. The positive ecological impacts of sharing and second-hand consumerism should not either be undermined, and it might even be a necessity for a sustainable future!

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Appendices

Appendix 1. Tori.fi Marketplace vertical content

Main Category	Sub Category
Accessories and watches:	Other clothes
	Clocks and jewellery
	Bags and hats
Biking and accessories:	Racer Bikes
	Mountain bikes
	Children's bikes
	Biking and accessories
	Bike accessories and helmets
	Other bikes
Books and magazines:	Other books
	Children's books
	Magazines
	Written books
	Studying books
	Hobby books
	Comics
Children's accessories and toys:	Safety seats
	Baby carriages
	Others
	Toys and games
	Children's accessories
	Children's furniture
Children's clothes and shoes:	Children's clothes and shoes
Clothing & Shoes:	Shoes and boots
	Dresses and skirts
	Clothes, overalls and suits
	Jackets
	Clothing & Shoes
Collecting:	Other collecting
	Coins and medals
	Tableware
Computers & accessories:	Computer programs
	Networks components
	Laptops
	Computer accessories
	Tablets

	Components
	Desktop computers
	Other computers & accessories
Constructing and renovations:	Electronics
	Insulation and roofs
	Tools, ladders and equipment
	Kitchen
	Windows, doors and floors
	HVAC and pipes
	Other constructing and renovations
	Heaters and fireplaces
	Bathroom, WC and sauna
Construction services:	Construction services
Electric home appliances:	Dishwashers
	Fridges and freezers
	Other home appliances
	Washing and drying machines
	Vacuum cleaners and cleaning
	Ovens and microwaves
Farming:	Farming
Films:	Films
Fishing:	Fishing
Garden & yard:	Plants & seeds
	Garden furniture & grills
	Other garden & yard
	Pots, rocks & decorations
	Lawn mowers & machines
Handiwork:	Handiwork
Horses and horse sports:	Saddles and accessories
	Horses and ponies
	Other utilities and accessories
	Trailers and transports
Hunting:	Hunting
Interior & furniture:	Shelves & keeping
	Other interior
	Carpets & textiles
	Antique & art
	Sofas & armchairs
	Beds & bedroom
	Decoration
	Tables & chairs
	Lights
	Paintings

Kitchen accessories and dishes:	Kitchen accessories and dishes
Music and instruments:	Other music and instruments
	Drums
	Pianos, organs and keyboards
	Music CD, DVD and records
	Guitars, basses and amplifiers
Other sports and hobbies:	Other sports and hobbies
Others:	Others
Pets:	Rodents
	Dogs
	Cats' and dogs' accessories
	Fish and aquariums
	Other animals
	Cats
	Animal parts
Phones and accessories:	Phones
	Mobile accessories
Photography:	Cameras
	Lenses
	Other photography
	Photographing accessories
Services:	Services
Sports:	Swimming and diving
	Golf
	Running and jogging
	Skiing and snowboarding
	Ball games
	Roller-skating and skateboarding
	Other sports
	Outdoors & Camping
	Ice hockey and skating
	Martial arts
	Soccer
	Gym & Fitness
TV/Audio/Video/Cameras:	Consoles and playing
	Other consumer electronics
	Home theatres, and DVD devices
	Audio and music players
	Television
	Digiboxes
Travel and Tickets:	Travel and Tickets

Appendix 2. Paavo data content description

Statistics Finland

Paavo 2017 - Data Content

Population structure 2015

Inhabitants (2014)
Females
Males
Average age of inhabitants
0–2 years
3–6 years
7–12 years
13–15 years
16–17 years
18–19 years
20–24 years
25–29 years
30–34 years
35–39 years
40–44 years
45–49 years
…
80–84 years
85 years -

Educational structure 2014

Aged 18 or over, total (2013)
Basic level studies
With education, total
Matriculation examinantion
Vocational diploma
Academic degree - Lower level university degree
Academic degree - Higher level university degree

Inhabitants' Disposable Monetary Income 2014

Aged 18 or over, total (2013)
Average income of inhabitants
Median income of inhabitants
Lowest income category
Middle income category
Highest income category
Accumulated purchasing power of inhabitants

Size and stage in life of households 2015

Households, total (2014)
Average size of households
Occupancy rate
Young single persons' households (–34 years)
Young couples without children (–34 years)
Households with children (0–17 years)
Households with small children (-3 years)
Households with children under school age (-7 years)
Households with school-aged children (7–12 years)
Households with teenagers (13–17 years)
Adult households (18–64 years)
Pensioner households (65 years –)
Households living in owner-occupied dwellings
Households living in rental dwellings
Households living in other dwellings

Statistics Finland reserves the right to changes

Households' Disposable Monetary Income 2014

Income recipient households, total (2013)
Average income of households
Median income of households
Lowest income category
Middle income category
Highest income category
Average purchasing power of households
Accumulated purchasing power of households

Buildings and housing 2015

Free-time residences, total (2014)
Buildings, total (2014)
Other buildings
Residential buildings
Dwellings
Average floor area
Dwellings in small houses
Dwellings in blocks of flats

Workplace structure (TOL2008) 2014

Workplaces, total (2013)
Primary production
Processing
Services
A Agriculture, forestry and fishing
B Mining and quarrying
C Manufacturing
D Electricity, gas, steam and air conditioning supply
E Water supply; sewerage, waste management ...
F Construction
G Wholesale and retail trade; repair of motor vehicles ...
H Transportation and storage
I Accommodation and food service activities
J Information and communication
K Financial and insurance activities
L Real estate activities
M Professional, scientific and technical activities
N Administrative and support service activities
O Public administration and defence; compulsory …
P Education
Q Human health and social work activities
R Arts, entertainment and recreation
S Other service activities
T Activities of households as employers;…
U Activities of extraterritorial organisations and bodies
X Industry unknown

Main type of activity 2014

Inhabitants (2013)
Labour force
Employed
Unemployed
Persons outside the labour force
Children aged 0-14
Students
Pensioners
Others (outside the labour force)

Appendix 3. Paavo data variable description

Variable list

posti_alue Postal code area
nimi Name of the postal code area
namn Name of the postal code area (Swedish)
euref_x X coordinate in metres
euref_y Y coordinate in metres
pinta_ala Surface area
vuosi Year
kunta Municipality 1 Jan. 2017
he_vakiy Inhabitants, total, 2015 (HE)
he_miehet Males, 2015 (HE)
he_naiset Females, 2015 (HE)
he_kika Average age of inhabitants, 2015 (HE)
he_0_2 0-2 years, 2015 (HE)
he_3_6 3-6 years, 2015 (HE)
he_7_12 7-12 years, 2015 (HE)
he_13_15 13-15 years, 2015 (HE)
he_16_17 16-17 years, 2015 (HE)
he_18_19 18-19 years, 2015 (HE)
he_20_24 20-24 years, 2015 (HE)
he_25_29 25-29 years, 2015 (HE)
he_30_34 30-34 years, 2015 (HE)
he_35_39 35-39 years, 2015 (HE)
he_40_44 40-44 years, 2015 (HE)
he_45_49 45-49 years, 2015 (HE)
he_50_54 50-54 years, 2015 (HE)
he_55_59 55-59 years, 2015 (HE)
he_60_64 60-64 years, 2015 (HE)
he_65_69 65-69 years, 2015 (HE)
he_70_74 70-74 years, 2015 (HE)
he_75_79 75-79 years, 2015 (HE)
he_80_84 80-84 years, 2015 (HE)
he_85_ 85 years or over, 2015 (HE)
ko_ika18y Aged 18 or over, total, 2014 (KO)
ko_perus Basic level studies, 2014 (KO)
ko_koul With education, total, 2014 (KO)
ko_yliop Matriculation examination, 2014 (KO)
ko_ammat Vocational diploma, 2014 (KO)
ko_al_kork Academic degree - Lower level university degree, 2014 (KO)
ko_yl_kork Academic degree - Higher level university degree, 2014 (KO)
hr_tuy Aged 18 or over, total, 2014 (HR)
hr_ktu Average income of inhabitants, 2014 (HR)
hr_mtu Median income of inhabitants, 2014 (HR)
hr_pi_tul Inhabitants belonging to the lowest income category, 2014 (HR)
hr_ke_tul Inhabitants belonging to the middle-income category, 2014 (HR)
hr_hy_tul Inhabitants belonging to the highest income category, 2014 (HR)
hr_ovy Accumulated purchasing power of inhabitants, 2014 (HR)
te_taly Households, total, 2015 (TE)
te_takk Average size of households, 2015 (TE)
te_as_valj Occupancy rate, 2015 (TE)
te_nuor Young single persons, 2015 (TE)
te_eil_np Young couples without children, 2015 (TE)
te_laps Households with children, 2015 (TE)
te_plap Households with small children, 2015 (TE)
te_aklap Households with children under school age, 2015 (TE)
te_klap Households with school-age children, 2015 (TE)
te_teini Households with teenagers, 2015 (TE)
te_aik Adult households, 2015 (TE)
te_elak Pensioner households, 2015 (TE)
te_omis_as Households living in owner-occupied dwellings, 2015 (TE)
te_vuok_as Households living in rented dwellings, 2015 (TE)

te_muu_as Households living in other dwellings, 2015 (TE)
tr_kuty Households, total, 2014 (TR)
tr_ktu Average income of households, 2014 (TR)
tr_mtu Median income of households, 2014 (TR)
tr_pi_tul Households belonging to the lowest income category, 2014 (TR)
tr_ke_tul Households belonging to the middle-income category, 2014 (TR)
tr_hy_tul Households belonging to the highest income category, 2014 (TR)
tr_ovy Accumulated purchasing power of households, 2014 (TR)
ra_ke Free-time residences, 2015 (RA)
ra_raky Buildings, total, 2015 (RA)
ra_muut Other buildings, 2015 (RA)
ra_asrak Residential buildings, 2015 (RA)
ra_asunn Dwellings, 2015 (RA)
ra_as_kpa Average floor area, 2015 (RA)
ra_pt_as Dwellings in small houses, 2015 (RA)
ra_kt_as Dwellings in blocks of flats, 2015 (RA)
tp_tyopy Workplaces, 2014 (TP)
tp_alku_a Primary production, 2014 (TP)
tp_jalo_bf Processing, 2014 (TP)
tp_palv_gu Services, 2014 (TP)
tp_a_maat A Agriculture, forestry and fishing, 2014 (TP)
tp_b_kaiv B Mining and quarrying, 2014 (TP)
tp_c_teol C Manufacturing, 2014 (TP)
tp_d_ener D Electricity, gas, steam and air conditioning supply, 2014 (TP)
tp_e_vesi E Water supply; sewerage, waste management and remediation activities, 2014 (TP)
tp_f_rake F Construction, 2014 (TP)
tp_g_kaup G Wholesale and retail trade; repair of motor vehicles and motorcycles, 2014 (TP)
tp_h_kulj H Transportation and storage, 2014 (TP)
tp_i_majo I Accommodation and food service activities, 2014 (TP)
tp_j_info J Information and communication, 2014 (TP)
tp_k_raho K Financial and insurance activities, 2014 (TP)
tp_l_kiin L Real estate activities, 2014 (TP)
tp_m_erik M Professional, scientific and technical activities, 2014 (TP)
tp_n_hall N Administrative and support service activities, 2014 (TP)
tp_o_julk O Public administration and defence; compulsory social security, 2014 (TP)
tp_p_koul P Education, 2014 (TP)
tp_q_terv Q Human health and social work activities, 2014 (TP)
tp_r_taid R Arts, entertainment and recreation, 2014 (TP)
tp_s_muup S Other service activities, 2014 (TP)
tp_t_koti T Services of households as employers; undifferentiated goods- and services-producing activities of households for own use, 2014 (TP)
tp_u_kans U Activities of extraterritorial organisations and bodies, 2014 (TP)
tp_x_tunt X Industry unknown, 2014 (TP)
pt_vakiy Inhabitants, 2014 (PT)
pt_tyovy Labour force, 2014 (PT)
pt_tyoll Employed, 2014 (PT)
pt_tyott Unemployed, 2014 (PT)
pt_tyovu Persons outside the labour force, 2014 (PT)
pt_0_14 Children aged 0 to 14, 2014 (PT)
pt_opisk Students, 2014 (PT)
pt_elakel Pensioners, 2014 (PT)
pt_muut Others, 2014 (PT)

Appendix 4. Descriptive statistics of the Tori.fi-dataset variables

			Statistic	Std. Error
userspop	Mean		.2251	.01052
	95% Confidence Interval for Mean	Lower Bound	.2043	
		Upper Bound	.2458	
	5% Trimmed Mean		.2067	
	Median		.2027	
	Variance		.018	
	Std. Deviation		.13435	
	Minimum		.10	
	Maximum		1.72	
	Range		1.61	
	Interquartile Range		.04	
	Skewness		8.939	.190
	Kurtosis		95.266	.378
adsuser	Mean		8.27712162700	.160895456000
	95% Confidence Interval for Mean	Lower Bound	7.95939882900	
		Upper Bound	8.59484442400	
	5% Trimmed Mean		8.21868034300	
	Median		8.19103773600	

	Variance		4.220	
	Std. Deviation		2.054175674000	
	Minimum		2.839506173	
	Maximum		14.177554440	
	Range		11.338048270	
	Interquartile Range		2.459952666	
	Skewness		.438	.190
	Kurtosis		.718	.378
mp_gd_pric	Mean		69.6176403200	1.02651720700
	95% Confidence Interval for Mean	Lower Bound	67.5905605900	
		Upper Bound	71.6447200500	
	5% Trimmed Mean		68.3908790700	
	Median		66.8044604600	
	Variance		171.759	
	Std. Deviation		13.10569437000	
	Minimum		44.10169492	
	Maximum		171.53333330	
	Range		127.43163840	
	Interquartile Range		11.78942432	
	Skewness		3.562	.190
	Kurtosis		23.047	.378